Chemical Age. 7 June 1947 WITH METALLURGICAL SECTION

THE CHEMICAL AGE

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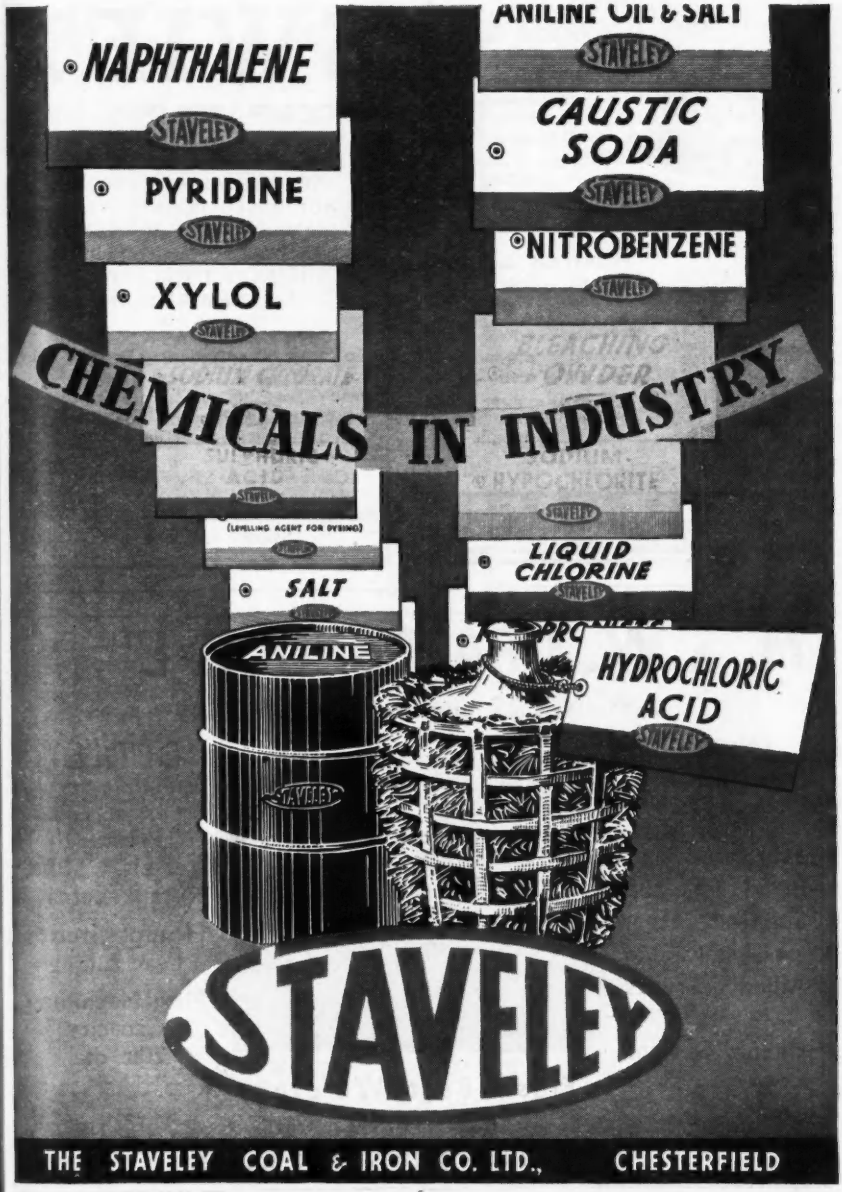
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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Conditions of Service

THE economic welfare of professional men is a subject upon which there are still diverse opinions. It is generally accepted to-day that workers in all categories should form themselves into bodies which, whatever they are called, have the legal status of a trade union in order to protect their common interest. There are still a number of professional men who do not believe that associations of this sort are in line with the dignity of their profession. That is the only reason we can suppose to be causing the abstentions which in many professions are common. There are, of course, those who believe that having once attained an adequate position in the world, a body of this sort can do nothing for them and may indeed react to their disadvantage. There are those who believe that their employers would look with disfavour on any move of that sort. The medical profession, on the other hand, is unanimous to all intents and purposes in its support of the B.M.A. and the same holds of other well-established professions. The profession of chemistry on the other hand is one in which there are a very large number of abstentions.

There should be a clear distinction drawn between a professional association or guild and a trade union of workmen. The two types of bodies have much in common but they have divergencies which are important. Perhaps the principal importance is the manner in which a disagreement with employers is handled. The professional body will rarely, if ever, resort to a strike whereas that is always conceded to be the most powerful and the ultimate weapon in the hand of the labour trade union. Mr. Norman Sheldon, the president of the British Association of Chemists, has given to the press a statement of the policy of the Association which in itself serves to outline the policy of a typical professional guild of this character. An unemployment benefit fund is the weapon whereby members are assisted to maintain their status by not accepting employment with inadequate remuneration or unsatisfactory conditions of service; a superannuation scheme, transferable when a member moves from one firm to another, is to be attempted together with a scheme which will enable pensions to be paid to those who are totally or permanently disabled; an appointment service helps those who are dissatisfied to change their employment; the meagre benefits offered by State insurance are to be supplemented by joint action; a policy is to be pursued which it is hoped will lead to the official recognition of the Association as a negotating body by industrial firms, Government departments, and the public authorities. The B.A.C. is registered as a trade union but while believing that members are entitled to play their part as individuals in the field of public affairs, the president states that " as a body we believe that it would be wrong to be associated with any political propaganda of a Party character." The B.A.C. is therefore a guild of professional men engaged wholly in furthering the interests of the profession, and is in line with the great tradition of guilds that existed in this country hundreds of years ago.

It cannot be denied that there is a great deal yet to be done before the profession of chemistry, and of many other professions

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too, is placed on a sound foundation. It is difficult to understand why any chemist or engineer abstains from joining a professional body which will look after his conditions of service and the general interest of the profession. The medical man, the legal man and no doubt many other professional men have no such inhibitions. Even if an individual foresees at the moment no personal advantage, as a member of the profession he should desire to raise the standard of the whole profession and to help his less fortunate colleagues.

One of the handicaps that any professional guild may have to face is that of a multiplicity of organisations. It is unfortunately true that that is the position to-day. We have seen within recent months that the labour trade unions affiliated to the T.U.C. have faced this issue by demanding that employers shall dismiss those who belong to rival unions. We cannot of course imagine that any professional body would adopt this method of settling its differences with another professional body. At the same time it is not altogether surprising that many will refrain from joining any body if there are rival bodies in the field all claiming to be the proper one for him to join. This situation is developing in several industries. When the coal industry was nationalised quite a number of bodies "touted" for members among those in or allied to the collieries each claiming that they spoke for the profession as a whole. In the carbonisation industry there are several bodies each of whom is trying to enlist everyone in the industry who can be persuaded to join it, often irrespective of whether the numbers joining are sufficient to constitute a true representation of the particular profession concerned. In the field of science there is the British Association of Chemists, the Association of Scientfic Workers, and others, all of whom are claiming to be the proper negotiating body.

It is time this situation was tidied up. If a professional trade union or guild has the interests of its members at heart, it must be a matter of indifference to its officials whether it is selected to represent the profession or not, so long as the profession is adequately represented by someone. The root of the matter is that there should be one responsible body only for any particular individual to join and that that body should be recognised as the right body both by employers and by the profession.

We do not propose to "take sides" in the matter by suggesting that any particular body should disappear in favour of any other body. The professional bodies that we have in mind must work out their own salvation. As an example the gas industry may be selected. The Gas Staffs Association sets out to represent the staffs employed in the gas industry, including the chemists, the accountants and so forth. On the other hand bodies such as the B.A.C. set out to represent the interests of all chemists. The principle at stake is this: Should the chemist in the gas industry be employed according to the

conditions of his *profession* as laid down by the B.A.C., or whatever body may be selected to represent all chemists, or should he come under the B.G.S.A. as representing the *industry*. Should the chemist, moreover, be regarded as a chemist and therefore represented by the B.A.C., or should he be regarded as a scientific worker and be represented by the A.Sc.W? We ask this question but we do not attempt to answer it. The strength of the British Medical Council lies in the fact that it is the one and established body for representing the interests of medical men. It appears to be regarded as unsuitable that the interests of medical men employed by local government bodies should be represented by N.A.L.G.O. Until there is a similar sorting out of functions among the various guilds that represent staffs, the position is bound to be confused and there will be great difficulty in any of these bodies obtaining full recognition from employers. Many incline to representation by professions, leaving the non-professional people to the heterogenous " industry " bodies. But there may be other opinions.

NOTES AND COMMENTS

Continental Power Plan

WITH the sun at the time of writing making uncomfortable fun of the Ministry of Fuel's " space heating " ban and the mercury hovering around the nineties, the cloud which the coal famine has cast for so many months on industry has for the moment lifted. Welcome though it is to be able for once to forget the problem of where next week's bunker supplies are coming from, it is useless to overlook the fact that the further outlook in the coal and power world is still distinctly unsettled, notwithstanding the recent apparent improvement in returns from the coalfields. And, if we take the longer view, the prospect of an early release from dependence for fuel on exiguous coal supplies, according to recent authoritative statements, is anything but rosy. Professor E. M. Oliphant—who should know—foresees that 10 to 15 years must elapse before atomic energy in Britain is " on tap." More encouraging in the circumstances is the news that experts are seriously studying a system, of which Hitler's scientists were the authors, to enable Britain to share some of the abundant hydro-electric supplies available or potential in Scandinavia and the South-east of the Continent. According to Dr. Ernst Busemann, who has been brought from Germany to London for technical discussions, the new method of conduction (by which Hitler in 1940 was confidently planning to supply power to his British workshops) would enable direct current at high voltages to be conveyed from Continental sources without transformers and at about one-fifth of the present cost of home generated power. The implications of this are almost as important as those of the nuclear fission schemes, but, like them, must be viewed as a long-term objective; it would take five years to connect us to Scandinavian or Alpine supplies. Only five months separate us from winter, 1947, and the need for intensified coal production and maximum economy meanwhile has not changed.

Glimpses of the Obvious

IN applauding the impulse which resulted in the issuing last week of the Government-sponsored " We Live by Exports," it is possible to wish, without being accused of intent to sabotage, that the over-simplification of national issues will not be carried any further. Nearly all the rather unpalatable facts of our present debtor state, which the Central Information Office has here mustered in collaboration with the Board of Trade, have been headlined in the Press with an almost monotonous frequency which can have escaped only the totally illiterate (those lucky people!) All this has, in short, been said before, and not only in the " Capitalist Press," and one doubts whether the " cat sat on the mat " technique and near-nursery illustrations which are the keynote of " We Live by Exports " will infuse much enthusiasm. Animated perhaps by the B.B.C.'s habit of having a quiz on all possible occasions, this publication has its own questions and answers corner and, while this bears a close resemblance to a form of advertising once made famous by a national hire-purchase furnishing firm (except that this seeks to explain in effect why the furniture will not be delivered), its failure to adduce anything not explained elsewhere in the text

suggests that the authors are under-estimating the intelligence of those who sport fourpence on "We Live by Export." As an example of how to acquaint the public with the facts this venture passes muster only if it can be regarded as a very elementary introduction to a much more factual survey. This, we suggest, might explain why great export industries are being starved of fundamentals and what is being done to remedy the shortages—a subject on which the foundry workers, for instance, have been demanding information in no uncertain terms.

Sinister Salt

SALT, that very common commodity which is always taken for granted, until there is a shortage of it—as there was recently in the cold spell—is again in the news. Having successfully hidden from newspaper reporters for two months, it now comes into the newspapers literally with explosive force. For it was sodium chloride (*sic*) which *The Times* declares was loaded into the barge which exploded in the Thames off Poplar last week. The explosion, as reported elsewhere, burst the sides of the barge, which sank, and caused some consternation in the neighbourhood. If this report is accurate it is as well that this phenomenal chemical, usually looked on as quiescent, was not distributed to cause havoc and alarm in the salt pots of the community. Some doubts as to the nature of this sinister salt, however, were caused by other reports of the occurrence. One newspaper referred to the substance as soda silico-fluoride, and yet another called it phosphorus. The mystery surrounding the nature of the barge's contents was cleared up—at least to our satisfaction—when our representative was told by the owners that the barge was carrying nitrate of soda. After this little divergence on "when is salt nitrate of soda?" another item of news forced the question "when is salt salt-less?" For those people who must have a salt-free diet a product has been made in America which "looks like salt, tastes like salt and flows like salt—but contains no salt." And that appears to be the answer to our poser.

Monsanto Disaster Unsolved

EXHAUSTIVE investigations on the spot have failed to reveal the causes of the explosion aboard the French vessel *Grand Camp*, which set off the chain of fire and explosions which wrecked the Monsanto Chemical works and most of Texas City, Texas, killing more than 400 on April 15-16. The report states that samples of nitrate of the kind carried on the French ship, when tested with rifle shots, burning oil and heated metal, did not explode. Attention is drawn to the conspicuous lack of precautionary measures which contributed to the disaster. "Hardly without exception," says the report, "persons who were concerned with the handling of the nitrate cargo displayed a lack of knowledge of the provisions of regulations governing the safety of operations either by land or water." Control of smoking on deck and in the holds had been lax, and although there were signs in French prohibiting smoking aboard, there was none in English.

Studious One:
Wouldn't you like to be a millionaire?

Sporty One:
I'd rather be a Coal Board official!

Society of Chemical Industry

Chemical Engineering Group

THE annual general meeting, followed by the annual dinner, was held at the Waldorf Hotel, London, on Wednesday, May 28, 1947. Mr. M. B. Donald (chairman of the group) presided.

After the minutes of the previous annual general meeting had been taken as read, and were confirmed and signed, the hon. secretary (Mr. E. Le Q. Herbert) presented his report for 1946. This pointed to a successful year of work, and showed that for the first time in the history of the group the membership had risen to more than 600. The issue of the annual volumes of Proceedings has unfortunately been subjected to delays on account of paper restrictions, and printing and binding difficulties. However, the Proceedings for 1943 have now been issued and it is hoped to bring the Proceedings up to date as quickly as possible. The hon. secretary paid a special tribute to the work of the assistant secretary (Mr. Mackie) and his staff.

The report and accounts were adopted.

There being no other nominations for the general committee than those put forward by the committee itself, the following were declared elected: M. B. Donald, R. S. Colborne, E. H. T. Hoblyn and F. Roffey.

The hon. officers for 1947-48 were elected as follows: Chairman, Mr. Julian M. Leonard; hon. secretary, E. Le Q. Herbert; hon. treasurer, F. A. Greene; hon. editor, D. M. Wilson; hon. recorder, H. W. Thorp. It was intimated that the hon. secretary might shortly find it difficult to continue the work as he has commitments in the North which will take him away from London, but he is continuing for the time being.

The retiring chairman (Mr. Donald) and the hon. officers and members of the committee were cordially thanked for their services.

Speeches at Annual Dinner

There was a large company of members and guests at the annual dinner, the principal guest being Sir Ben Lockspeiser (chief scientist, Ministry of Supply). Regret was expressed at the inability of Air Marshal Lord Tedder (chief of the Air Staff) to be present owing to ill-health, and a message was received from Dr. William Cullen, who had reached the age of 80 the previous week, regretting that ill-health prevented him attending, and expressing wishes for a successful gathering. A message of good wishes was agreed to be sent from the gathering to Dr. Cullen, and the chairman thanked Sir Ben Lockspeiser for filling the gap at the last moment.

Toasting "The Society of Chemical Industry," the chairman referred to atomic energy, and after mentioning the introduction of gunpowder and saltpetre, said that less than 5 per cent of the latter had gone into warlike needs. Now American chemical engineers had succeeded in the large scale diffusion of uranium compounds to obtain the active constituent. We were very close to that occurrence and rather frightened of this new discovery. As a result, we now had in this country an Atomic Energy Act which he could not but view with the greatest dismay. The advent of the legal mind into scientific matters was usually unsatisfactory. The international pact on gas warfare put us in the peculiar position in the last war that if our troops lit a green wood fire so as to disable the enemy by acrid smoke, they were perfectly in their rights. If, however, the active compounds were released from a gas cylinder so as to make the enemy's eyes smart, it was breaking our sacred word! The same, he feared, applied to our latest Act.

Were we not strangling all incentive for development by these restrictive measures and were they really necessary? Chemical engineers were probably better aware of the danger and the good of these discoveries than anyone else, and perhaps it would help to orient our views about atomic energy from this too close a contact if he misquoted a predecessor of Bertrand Russell who bore the same name as the inventor Sir Francis Bacon and say: "He who hath large cities hath given hostages to fortune." If 12 atomic bombs were exploded at that moment in the Highlands of Scotland, we would be unaware of the fact and the damage to the effective strength of the country would be nil. But the same bombs exploded in London, Birmingham, Manchester or Glasgow would so cripple the nation that the armed forces would not be left with much to defend. What was being done to disperse our cities, our incredible hostage to fortune? Was it not true that in our atomic energy project, chemical engineering was very much understaffed? Was it not true that the meagre contribution which the profession of chemical engineering was making in consequence was taken in some quarters to be a true measure of the small use to which chemical engineering might be put in this type of work? On this point, he could assure the authorities that nothing was farther from the truth.

Speaking more directly to the toast, the chairman said the Chemical Engineering Group was now 28 years old and was the oldest of the groups of the Society.

The toast was coupled with the name of Mr. Cremer, president of the Institution of Chemical Engineers and joint hon. secretary of the Society of Chemical Industry, who took the place of the president of the society—Dr. L. H. Lampitt—who was unable to be present.

Mr. H. W. Cremer responded to the toast on a light note for the most part, paid a tribute to the work of the group and its retiring chairman, Mr. M. B. Donald, and welcomed the new chairman, Mr. Julian M. Leonard. He also referred to the new general secretary of the Society, Col. Griffin, whom he spoke of as a charming person, one who was working tremendously hard for the good of the Society, a kind friend and one from whom the group would always have the greatest support.

Mr. S. J. Tungay then proposed "Our Guests," mentioning some of them and giving them all a hearty welcome, at the same time coupling with the toast the name of Sir Ben Lockspeiser.

Sir Ben Lockspeiser, responding to the toast, said that while chemistry was his first love he was swept into aeronautics after the last war.

Generally speaking, flying had always been dependent on the chemical engineer for fuel. The aircraft engine was a very "touchy" piece of mechanism as regards the fuel it wanted. Fuel of a higher octane number than ordinary liquid fuel had always been used and experimented with and the chemical engineer had always produced the type of fuel that laboratory experiment showed to be necessary. Indeed, these high octane fuels were a major contribution to the winning of the Battle of Britain.

After referring to the use of the gas turbine for large power generating stations, Sir Ben said that it was not at all fussy as regards the kind of fuel it would burn and it was possible to change from one fuel to another without any great difficulty being experienced. Indeed, the gas turbine would burn almost anything. Therefore, it was not necessary to have the expensive fuels that were called for by the piston engine.

The question we had to face was should we not import crude petroleum to obtain aromatics, olefines, acetylene and a number of raw materials which would act as a starting point for the manufacture of rubber, plastics and a whole variety of other substances on the threshold of which we now were.

One German achievement which had impressed him was the production from coal of a urethane, which was considered to be a better rubber than natural rubber for tyres. It was true that it was produced from coal but it was also true that it did not represent the end of the possibilities. By using crude petroleum as the starting point it was possible to make a number of polymerised products off a rubber-like nature of which we could take great advantage.

Concluding, Sir Ben said he thought the British chemical engineer could make his contribution to the economic future of this country, which he believed would be done with great advantage to the country and to the abounding credit of British chemical engineers.

A cabaret show concluded a very enjoyable evening.

U.S. Heavy Water Supplies

Domestic Research

THE U.S. Atomic Energy Commission plans to permit distribution of heavy water and deuterium gas to qualified domestic research institutions. Supplies will be handled by Stuart Oxygen Co., San Francisco. The company will convert the heavy water to deuterium gas if desired by the purchaser.

To preclude the possibility of mis-use or inefficient use of the materials, all applications are scrutinised by a special committee before acceptance by the Stuart Oxygen Co. It will be necessary for the users to furnish the Atomic Energy Commission with particulars of the experiments undertaken.

Among the uses to which heavy water and deuterium gas may be put, are the following:

(a) High-voltage accelerators, *e.g.*, the cyclotron.
(b) As an effective moderator, heavy water slows down fast neutrons.
(c) Determination of gamma-ray energy.
(d) Study of molecular structure.
(e) Tracer for hydrogen.

New Chemical Plant Factory

The Board of Trade have allocated a wartime factory to W. J. Fraser & Co., Ltd., for the manufacture of chemical and allied plant. The factory is at Monk Bretton, near Barnsley, South Yorkshire, and is centrally situated both for delivery of raw materials and of finished plant to the Midlands and the North. When fully equipped, the new factory will be able to handle much heavier equipment than is possible at Dagenham. Production is scheduled for August.

Chemical plant and equipment for installation in the London area and the southern and eastern counties will, in the main, still be made at Dagenham.

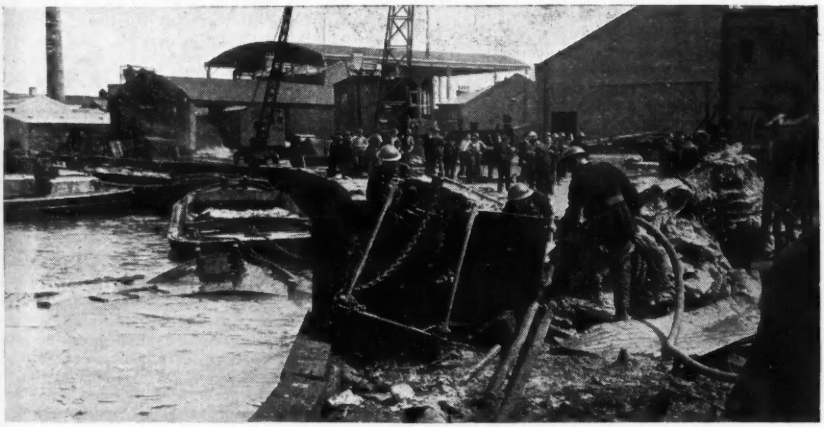
LONDON BARGE EXPLOSION

JUST before mid-day on Friday, May 30, the barge *Teal* (owners Messrs. Vokins & Co., Ltd.), caught fire and exploded with great violence at the wharf of the Lea Haulage and Wharfage Company, Canning Town. The cargo, said by *The Times* to be sodium chloride, and by other papers to be soda silico fluoride or phosphorus, but which a spokesman of the owners informed our representative was sodium chlorate, was contained in sacks. It is reported that when one of the sacks was seen to be smoking, the men engaged upon unloading the barge leapt to the wharf and had just reached safety when the barge exploded, and quickly sank. Fortunately, there was no loss of life.

Another barge nearby, parts of the wharf and adjoining buildings were set on fire. A series of four explosions dislodged slates and masonry, and shattered windows in the vicinity. According to one of the employees of Messrs. Vokins, the force of the explosion threw several people off their feet as they walked in nearby Orchard Place. There was a blinding white flash and several pieces of the barge were thrown high into the air. A stevedore, who was working on a ship close by, said that at the first explosion, he and his workmates ran from the dock. The barges were already blazing furiously and more explosions sent smoke up to a height of 100 feet.

Another onlooker described how falling debris rained down on adjacent buildings and over Leamouth Road, and how women workers in a canteen became hysterical and ran into the road screaming. The damage, as yet unassessed, is believed to be heavy.

It is understood that the barge-owner's solicitors are holding an inquiry, while the Fire Service and River Police are making an independent investigation.



A photograph showing firemen working on the wreckage, with the sunken barge in the foreground on the left. (*Evening News photograph*)

Scientific Methods

"I am firmly of the opinion that there is hardly an industry in this country that cannot benefit by the application of the scientific method to its problems, and that we cannot hope to reduce our production costs, develop new processes and maintain our industrial efficiency without the help of science." This belief is the basis of all the work of the Department of Scientific and Industrial Research, and is re-stated by the secretary of the department, Sir Edward Appleton, in the course of the article "How Science Can Help Industry" in the May 31 issue of the *Board of Trade Journal*.

Atom Work and Health

Dr. J. Rotblat, senior lecturer in physics at Liverpool University, who was principal assistant to Prof. Sir James Chadwick, speaking at Liverpool last week, described as "poppycock" and "pure nonsense" the suggestion that working in atomic energy plants had harmful effects on health. "I have handled radio-active materials for many years and have been exposed to strong doses of radiation," he said. "In Liverpool University we use radiations far greater than anything used in factories and we have noticed no ill effects."

Oak Ridge Atom Project

FOLLOWING its two years' operation of the Clinton Laboratories, the atomic energy project at Oak Ridge, Tenn., the Monsanto Chemical Company will retire from the project on June 30 due to a difference between the chemical company and the Atomic Energy Commission which grew out of Monsanto's proposal to move the power pile and radioactive tracer work being carried on at Oak Ridge to its own research laboratories at St. Louis, Mo., Dayton and Springfield, Ohio. After June 30, operation of the Oak Ridge research and development laboratories will be turned over to another private contractor, still undetermined, who will be the fourth organisation to run the Clinton laboratories. Previous operators have been a group of scientists from the University of Chicago who were followed by the E.I. Du Pont de Nemours & Company which was in charge of the project until June, 1945, when Monsanto took over.

Problems of management and proper supervision were understood to have motivated Monsanto's decision to retire from the project where to-day employment totals 2150, which is a substantial increase from the war-time peak of 1234. Work at Clinton Laboratories—the laboratory name for the Oak Ridge project—covers a wide range of tracer chemistry work with radio-isotopes, biological studies and reactor design. These include development of a reactor suitable for generation of power. After a discussion with Monsanto officials, the Atomic Energy Commission decided that " in the light of the over-all research and development programme in atomic energy, the work of the Clinton Laboratories must continue at Oak Ridge." While praising the " substantial progress " which had been made under Monsanto's operation of the project, the commission held that it would be impractical to move the pile and other physical equipment installed at Clinton, especially since a big new facility is being built at Dayton, Ohio, which will be operated by Monsanto.

FOG DISPERSION BY CHEMICALS

Increased attention is being given to several unfamiliar uses of calcium chloride, of which one of the most promising is as a fog dispersing agent. The principle, stated to have been discovered by a chemist in California, has already proved its effectiveness on several airfields in San Francisco and elsewhere. The chemical is sprayed from a low-flying plane in the form of powder—the hydroscopic property of which is heightened if the powder is heated, and good results have also been secured by spraying the calcium chloride in the form of a solution from tall hydrants.

Low Heat Cement

BRITISH Standard Specification for low heat cement, No. 1370 : 1947, which has just been issued, covers a type of Portland cement intended for use in structures such as dams, where large masses of concrete have to be placed; it aims at overcoming some of the difficulties encountered with the use of ordinary Portland cement.

The reduction in the heat of hydration, as compared with ordinary Portland cement (B.S. 12 : 1940) has been achieved by fine-grinding the cement, which also has the effect of reducing the tendency of a concrete mix to segregate and the consequent separation of water at its surface, and by a reduction in the maximum permissible lime content. These changes do not affect the ultimate strength of the cement, though the rate of strength development is appreciably lower than in the case of ordinary Portland cement.

The specification defines the methods to be used in selecting samples for testing and the appropriate tests for fineness, chemical composition, strength setting time, roundness and heat of hydration. The test for fineness is to be carried out by the determination of the surface area per unit weight of the sample by means of a permeability cell connected to a manometer and flow-meter, as it has been found that the conventional sieve tests give no indication of the size of the finer particles. The necessary apparatus and method of operation are described in detail.

ATOMIC POWER STATION IN CUMBERLAND ?

OFFICIAL caution and denials that any decision has been reached to re-develop the Royal Ordnance Factory at Drigg, West Cumberland, as a major centre for the production of atomic energy have not discouraged the view held in the district and supported by a good deal of evidence that this may take place in the near future. Residents have received assurances that, if this should be the fact, there would be complete safeguards from atomic hazards such as radio-active dust, while unsightly cooling towers would not be required. It is generally believed that if an atomic energy station materialises it will be in the form of a major electrical generating station, and the figure of 75,000 kW from each uranium engine has been mentioned.

The R.O.F. factory, which during the war made explosives, has also been spoken of as the site for a major chemical works and is within the scope of the West Cumberland Development Area in which 65 per cent of local labour is to be re-deployed, owing to the decline of the local coal, in the iron and steel industries.

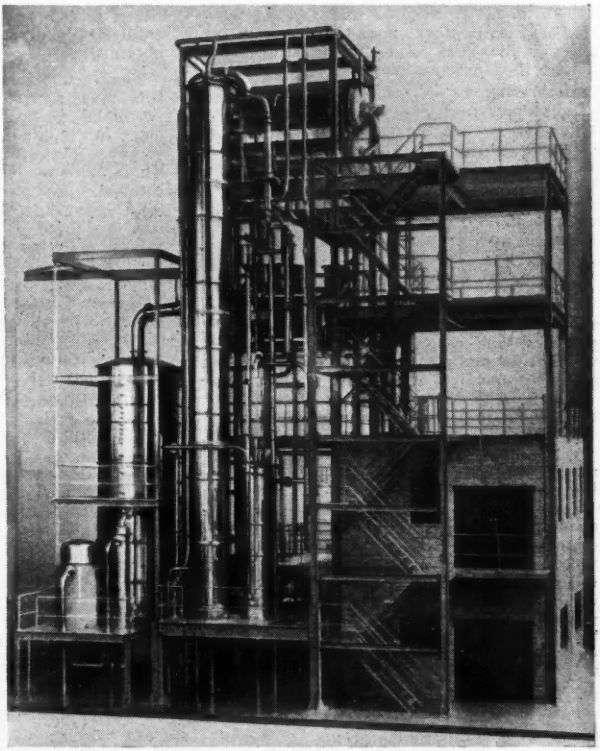
CHEMICAL PLANT IN MINIATURE

Distillation and Solvent Extraction

ONE of the most nearly perfect replicas in miniature of a chemical installation has been attracting a good deal of interest in Birmingham, following its recent exhibition at the B.I.F. It is a working model built on a scale of 1 : 12 by the development department off the London Aluminium Co., Ltd., Witton, Birmingham, of a design by their technical staff of a modern distillation and solvent extraction plant. Built in copper and stainless steel, it reproduces every detail to scale and is capable of doing in a small way everything the full-scale plant could perform.

The function of the plant is to recover glacial acetic acid from an aqueous solution of dilute acetic acid. The dilute acid is first extracted by means of a solvent which dissolves the acetic acid and some of the water. The rest of the water passes out from the extraction tower practically free from acetic acid but saturated with ethyl acetate to a storage tank. The extraction tower consists of a stainless steel vessel running practically the full height of the steel structure and contains material designed to give a large area of interfacial contact between the aqueous and solvent phases. The efficiency of extraction amounts to 99.8 per cent.

The solution of solvent, acid and some water is separated into glacial acetic acid, solvent and water saturated with solvent by fractional distillation in the main column. The acid obtained at the base contains corrosion products, etc., and is distilled in one of two glacial acid stills. The vapour is condensed in a condenser made of stainless steel and water-white acid is obtained, the contaminating material being left as a residue in the glacial acid stills. The solvent and water saturated with solvent are obtained as separate layers in the decanter and run to the appropriate tanks. The water obtained from the extraction tower and the lower layer in the decanter is stripped of the ethyl acetate in solution by steam stripping in a bubble cap column.



Photograph of the Model Plant

The vapour obtained at the head of the column is condensed and the two phases produced are separated in a decanter. The water layer is fed back to the column as reflux while the solvent is run to storage. At the base of the column water free from solvent is obtained and serves to preheat the feed to the column before running to waste.

CHEMICAL ENGINEERING

PRACTICAL BENEFITS FROM RESEARCH

AN interesting and representative range of chemical engineering problems of contemporary importance was dealt with by experts at the recent regional conference in Missouri of the American Institute of Chemical Engineers. Methylamines, catalysts for toluene production, the recovery of caustic soda by dialysis and the acceleration of exploratory work by the use of chemical kinetics and mathematics were among the subjects discussed.

Describing means by which some control of the incidental production of trimethylamine has been achieved in the production of methylamines, Dr. R. S. Egly and Mr. E. F. Smith, of the Commercial Solvents Corporation, indicated that the undesirable production of trimethylene had been reduced to a minimum by reducing the time the methanol and ammonia were in contact with the catalysts.

Three Factors

Dr. Egly reported that research had shown that by proper choice of temperature, pressure, and reaction time, it is possible to limit trimethylamine production, getting a high proportion of the raw material converted into the more desirable monomethylamine and dimethylamine. Furthermore, it was discovered that addition of water to the reactor feed suppressed trimethylamine formation and had very little effect on reactions to the other amines.

Dr. Egly also presented considerable data on a third method for retarding trimethylamine formation, recycling of trimethylamine through the reactor. The percentage of trimethylamine in the product builds up until trimethylamine is decomposed in the reactor as fast as new trimethylamine can be formed from the methanol and ammonia. Recycling of trimethylamine had been previously reported in the patent literature, but very little actual data on the reaction was available.

Toluene Catalysis

Important advances in methods of producing toluene developed at the Richmond Refinery of the Standard Oil Company of California in response to the wartime demand for TNT were described by five members of the California Research Corporation. An effective catalyst which readily converted petroleum fractions into toluene was developed and a reaction vessel was designed for cyclic operation for the rapid regeneration of the catalyst.

The catalyst finally developed showed two outstanding properties—high activity for production of toluene from the feed stock and ability to withstand the high regeneration temperature required. The laboratory work showed the optimum catalist to be alumina containing about 8 per cent molybdenum as the oxide, made into 3/16 in. pellets. That this catalyst was eminently suited to the requirements was demonstrated in commercial use where a catalyst life of two years and greater was obtained.

The feed stock chosen for toluene protion was a well-fractionated straight-run petroleum boiling in the range 180 to 230 deg. F. obtained from California crude supply. This contained methylcyclohexane which, upon dehydrogenation over the catalyst, produced the major amount of toluene in the process. A two-pass operation was used to purify the toluene. The first pass charged the 180 to 230 deg. F. straight run petroleum and produced a toluene concentrate for second pass feed. The second pass removed impurities in the toluene without use of any special purifying facilities, producing a nitration grade toluene containing less than 1 per cent total impurities.

The commercial reaction vessels were of multi-bed design to avoid high pressure drop and resultant high cost of circulating regeneration gas. Ten catalyst beds each three feet deep in the form of an annulus of 40 ins. inside diameter and 9 ft. outside diameter were provided in each reactor. The plant contained four of these reactors.

Recovering Caustic Soda

Because of the need to reduce the consumption of caustic soda in the production of viscose rayon, effective processes have been applied to reduce the 1¼ lbs. caustic to 1 lb. rayon ratio. Discussing these, three members of the Ohio State University who have been prominently associated with the work emphasised the contribution which it was capable of making to the relief of the general shortage of caustic and soda ash. Dialysis, usually carried out with a colloidal membrane from one side of which the material to be recovered is collected, was now being employed on a commercial scale. When the production of viscose rayon was at a peak of about 200 million lbs. more than 90 million lbs. of caustic soda is estimated to have been saved by dialysis. The principle, the research workers pointed out, is capable of very wide extension to other industrial processes where separations appear at first sight to be impracticable.

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PRECIPITATION HARDENING—III*

by L. SANDERSON

REFERENCE has already been made to the adverse influence, in certain instances, of the structural changes brought about by precipitation of carbides on the corrosion resistance of a material. This is particularly noticeable in connection with austenitic nickel chromium (18-8) stainless steel into whose composition enters about 0.12 per cent of carbon. The carbon is in the solid solution state, and as long as the steel remains at normal temperature, its resistance to corrosion is extremely good. However, it suffices only to heat it to a temperature within the range 550° to 750° C. for a noticeable precipitation of chromium carbides to occur, which immediately brings about a loss of corrosion resistance in the steel.

Impact Resistance

The next property to be affected by precipitation hardening is the impact resistance, which is usually measured by notched bar tests: Izod in this country, Charpy on the Continent. No great stress need be laid on the fact that a marked increase in resistance to impact is experienced, at all events in the duraluminium group of alloys, as a result of precipitation hardening. No specific percentage of improvement can be quoted here, because the exact figures depend on the direction in which the specimen is selected in relation to the direction in which the material was originally rolled.

We may now consider specifically the effect of precipitation hardening upon the alloys of aluminium. These alloys have attained a considerable industrial and commercial importance, and it is essential that the benefits derived from a heat treatment inducive of precipitation hardening should be understood. The alloys are broadly divisible into two main classes, those of wrought type, and those primarily employed in the form of castings.

The wrought alloys embody primarily percentages of copper and magnesium, or percentages of magnesium and certain other alloying elements, without copper. Among the former are the duralumin alloys, which contain copper, manganese, magnesium and silicon, in addition to the aluminium base; and the Y and R.R. alloys containing copper, iron, nickel, magnesium and silicon. Of these two groups, the first are mainly used in sheet form, while the second are designed mostly for forgings. The group not containing copper include in their composition silicon, magnesium and manganese. In Table I will be found a brief summary of the composition of the various wrought aluminium alloys.

TABLE I

Alloy No.	1	2	3	4	5	6	7	8	9
	per cent.								
Copper ..	4.0	4.0	4.0	4.0	4.0	2.0	—	—	—
Magnesium	0.5	1.5	0.0	0.5	0.5	1.0	1.2	7.0	0.6
Silicon ..	0.5	0.5	2.0	0.5	1.5	1.0	1.2	—	1.0
Manganese	0.5	0.5	—	0.5	0.5	0.0	0.0	1.25	0.0
Iron ..	0.5	0.5	0.0	0.5	0.5	1.0	0.0	0.0	0.0
Nickel ..	0.0	2.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Titanium	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0

The casting alloys normally contain 5.5 per cent of copper, in which case they are used for die casting purposes, or 8.0 per cent of copper, when they are suitable for sand and chill castings. Other alloying elements are sometimes introduced into the composition for particular purposes, e.g. silicon to give the metal greater fluidity during the casting operation, and to facilitate precipitation of Al-Fe-Si, which, being insoluble and containing iron, prevents the iron from exercising its known adverse influence on precipitation hardening. Silicon used for this purpose is usually present to the extent of about 1 per cent.

Other Alloys

Another group of casting alloys contain copper and magnesium, and correspond largely to the first group of wrought alloys. A third group of casting alloys includes magnesium and silicon to the extent of 12 per cent, but no copper.

To produce precipitation hardening in these aluminium alloys, a form of heat-treatment is necessary, which must be considered in its three stages, comprising solution heat-treatment or "normalisation;" quenching; and precipitation heat treatment. To give the solution-treatment, it is essential to employ a modern, pyrometrically-controlled furnace so as to ensure the maintenance of an even temperature during the entire treatment period, and to prevent the treatment temperature from exceeding the specified limits, which are not wide. In

* Previous articles appeared on February 1, and April 5, 1947.

solution treating duralumin, for example, best temperature is between 490° and 500° C., and should be confined within these limits. If the material is raised to too high a temperature, the result is that the eutectic fuses, and the material is rendered insufficiently ductile. On the other hand, if the right temperature is not attained, the excess phase will not go completely into solution, and the metal will be too soft for its purpose.

Air Furnaces

Either air furnaces or salt baths can be employed for this form of treatment. The advocates of the air furnace claim for it that it is not complicated, presents no operational difficulties, can be maintained easily, and has no personal risks such as are found with the salt bath. On the other hand, it does not bring the material to temperature so quickly as the salt bath, and it is more difficult to regulate the furnace with precision, while heating is less uniform and there is a risk that the parts being treated may become discoloured. Air furnaces may be heated either by gas or electricity, but it is essential that the air should be kept continuously in circulation.

The salt bath is usually electrically heated, and is of the sodium nitrate type. In treating aluminium alloys in this type of furnace, the first requirement is thorough cleanliness of the material being treated, which must be free from grease, dirt or moisture. Neglect of this precaution may result in a dangerous crepitation and explosion of the salts. Sheets to be treated in the salt bath are mostly hung from metal racks carefully arranged so that no sheet comes into contact with its neighbour. To place the sheets flat on top of one another is bad practice, because it leads to a lack of uniformity in hardening. Small objects and pieces are either hung in the bath from wires, or suspended in a wire basket by wires. Absence of contact one with the other is essential.

Those alloys containing a high percentage of magnesium are not solution-treated in salt baths because explosions result.

After the material has been solution-treated, it must be quenched in a suitable quenching medium, usually cold water. A sharp cooling action is necessary, because otherwise there is a danger that the quenched material might develop intergranular corrosion, even though it might have the desired degree of hardness. Not every alloy is liable to develop intergranular corrosion, but a test is necessary if uncertainty exists. This comprises allowing the specimen to remain in a bath of sodium chloride and concentrated HCl for 24 hours at a temperature of 24° C., and afterwards examining the piece under the microscope for signs of cracking. Oil in any event is unsuitable as a quenching medium when the part has been treated in a sodium nitrate salt bath because the hot nitrate and the oil would react upon one another and cause an explosion.

After the piece has been quenched, it must be well washed to eliminate all vestiges of the salt, and thus develop a cooling rate quick enough to obviate later intergranular corrosion. If the material has been heated in an air furnace, and has suffered discoloration, an addition of from 3 to 5 per cent of potassium dichromate to the quenching bath will remove the stain. This applies equally where the discoloration has been caused by alkalinity in the quenching medium.. In general, full immersion in the quenching bath is preferable to other methods of quenching, e.g. the use of sprays, because the latter are less rapid in their cooling rate, and consequently render the material more liable to intercrystalline corrosion.

The precipitation hardening treatment may, like the solution treatment, be carried out in an electrically heated air furnace with forced air circulation. Full pyrometric temperature-regulating and recording equipment should be employed. Small parts can be treated in oil baths. In some works it is customary to begin with a softening or annealing treatment where the part has previously been subjected to mechanical working while in the cold condition.

When the parts to be treated are castings, they will require a longer heating period at the correct temperature to ensure that the heat penetrates right to the centre of the piece. The finer the grain resulting from speedy solidification, the shorter this heating period will be. Die castings are usually heat-treated by reason of the fineness of their grain structure.

Duralumin Alloys

The duralumin group of aluminium alloys is usually precipitation hardened by heating to a temperature in excess of 420° C. and quenching in water to atmospheric temperature. The effect of the different alloying elements on the precipitation hardening properties of these alloys has been carefully studied, and it appears to have been established that silicon up to 0.25 per cent does not noticeably influence the precipitation hardening of duralumin alloys, and that these alloys do not need to be artificially aged, since their ageing takes place spontaneously as long as magnesium enters into their composition. The absence of magnesium, or its presence in very minute quantity, as in super-duralumin, where it is present to the extent of only 0.5 per cent, involves an artificial ageing treatment. In the ageing of these alloys, both Mg_2Si and $CuAl_2$ exercise an indispensable influence.

The suggestion has been advanced that the Mg_2Si does the hardening work at normal temperature, and the $CuAl_2$ at higher temperatures.

Iron in small percentages appears to retard precipitation hardening, and to reduce the degree of hardness attainable at a temperature of 200° C. When present to the extent of 0.32 per cent, it stops precipitation hardening altogether. Silicon to the extent of 0.25 per cent prevents the iron from influencing precipitation hardening, but not completely, and even as much as 1 per cent will not suffice to counteract the adverse influence of 0.6 per cent of iron. If the iron content is increased to 2 per cent there will be no spontaneous aging of the material at room temperature, and ageing can only be restored by the addition of 0.03 per cent of magnesium. It should be noted, however, that iron in the alloy leads to a refinement of the grain structure by creating an insoluble, iron-rich constituent at the crystal boundaries.

In brief, we may say that copper facilitates aging; iron prevents and retards aging; silicon facilitates aging and minimises the adverse effect of iron; magnesium and manganese facilitate aging.

It must not be imagined that the elements introduced into the aluminium (duralumin) alloys are limited to those so far discussed. Some compositions include small percentages of other elements, among which may be mentioned the following: Chromium is added in percentages over 0.1, to improve machinability. Such additions do not appear to have any adverse effect. Zinc to the extent of 19 per cent is not uncommon as an alloying element, and is claimed to produced an alloy capable of swift hardening and softening at room temperature within a few seconds. It gives a material having an ultimate tensile strength of 75,000 lb. per sq. in., but is said to be brittle and crack at room temperature. Another alloy of this type contains from 18 to 21 per cent zinc and 2.7 to 3.3 per cent of copper, and is used in the form of bars and sheets.

Nickel is largely employed as an alloying element in this group of aluminium alloys, but seldom exceeds 2.0 per cent; 1.5 per cent of magnesium is usually added at the same time to produce the familiary Y alloy. This is highly corrosion-resistant, and is suitable for die-cast pistons, forged connecting rods, cylinder heads, and other parts of aircraft engines operating at high temperatures. It is, however, liable to embrittlement at high temperatures.

Titanium is introduced as a grain refiner into duralumin composition, and in addition it has the effect of slightly improving the mechanical properties and the resistance to scaling at elevated temperatures. Beryllium up to 0.7 per cent is sometimes added, but has no appreciable effect. Germanium is no improvement, and is liable to lower the resistance to corrosion, calcium up to 0.1 per cent lowers the brittleness at elevated temperatures. Lithium has been tried as a substitute for magnesium, and seems to be fairly effective from this point of view.

(*To be continued*)

NON-FERROUS FORGINGS

MANUFACTURERS of machines and equipment of various kinds often find that the use of brass or aluminium forgings solves troublesome problems arising from need of non-porosity, corrosion resistance and minimum finishing operations. The cost of producing parts is reduced because they can be forged to closely approximate finished size and shape, so require relatively little machining, with consequent lessening of scrap.

These forgings are used most often in preference to otherwise processed parts where maximum strength and reliability in service are required. Engineers are specifying the non-ferrous forgings more and more in the manufacture of peace-time products where close dimensional limits and smooth surfaces are essential. The forgings give most satisfactory service in machines in which parts must be proof against rust or corrosion.

Much kitchen equipment for hotels, restaurants, steamships and railway coaches has parts made from brass forgings, as the finished product can be made and placed on the market at less expense than when the parts are fabricated by other methods and the metal withstands the erosive and corrosive effects of steam and various foods during cooking and serving. Manufacturers of food-processing machinery are using parts of this type for similar reasons. Brass forgings have been found both satisfactory and economical in the manufacture of milking machines, as they have in many other industries, including the manufacture of agricultural implements, farm equipment, abattoir machinery, motor vehicles, aircraft and ships.

Intricate parts having lugs, bosses, fillets and cavities can be forged by hammer or press from brass, copper, aluminium-silicon bronze, aluminium alloys and magnesium alloys with 1 to 7 deg. outside draft, $\frac{1}{4}$-in. radii, 3/32-in. web thickness, and tolerances of plus or minus 0.005 or 0.007 in. on a 1-in. dimension and plus or minus 0.015 or 0.020 in. on dimensions from 4 to 6 in. Actual tolerances obtained depend largely upon details of design of the specific forging involved. They can be closer on regular and naval brass than on the other metals mentioned above.

POST-WAR STEELS

DEVELOPMENT work on new steels was stepped up at least ten years during the war period. New steel quality will soon become evident in thousands of applications in the heavy industries and in better manufacturing tools. The trend away from a bewildering number of grades of alloy steels was speeded by the critical shortage of strategic materials. The war extended the use of corrosion-resisting steels to the weather of high altitudes. These experiments have shown the way to new applications of stainless steel promising light weight as well as high strength, with resistance to atmospheric corrosion included.

The speedy deposition of a thin phosphate film on sheet or strip steel has found many uses in war-time and will continue to serve requirements in the post-war years. Other coatings have been developed for strip and wire. In the manufacture of cartridge cases the steel industry learned new points in the deep drawing of steel. Welding of steel plates, accelerated by war-time shipbuilding, has become a common tool of fabrication. New advances have been made in forging and casting steel.

Composite materials of great variety also came out of the steel laboratories during the war. The advantages of thin layers of one metal applied to another are widely appreciated. For example, the recently-developed aluminium-coated steel sheet combines the corrosion-resistance, heat-resistance and appearance of aluminium.

Steel for Special Uses

Many alloy types of light steel have been developed recently for special uses. High-silicon sheets and strip, for example, have a wide use in the electrical industry. All electric generators, transformers and motors now contain silicon steel sheet or strip. The improvement in the quality of this material has been an important factor in the improvement of electrical equipment.

Stainless steel sheet and strip, the aristocrats of the group with respect to strength, corrosion-resistance and appearance, require no coating for protection and are now widely used where corrosion-resistance is the first consideration. Present uses of stainless vary widely, from kitchen sinks to exhaust manifolds for aircraft engines. It has been found to be the most suitable material for the latter purpose because it maintains strength and resists corrosive effects at high temperature. Applications of modern stainless steel are many. Huge pieces of equipment are made from it as well as small items of jewellery. Much stainless equipment is now found in chemical industries. Mineral and organic acids and salt water makes it particularly desirable in the food industry. The pulp and paper industry uses it extensively. It has been of great value to the petroleum industry because of its maintenance of strength at high temperatures.

Improved practice in producing metal for light steel, improved techniques in fabricating, and improved coatings are the three factors which are counted upon to further expand the use of sheet and strip products. The shaping, in a press, of the turret top of an automobile from a single piece of sheet steel is a good example of the need of high-quality light steel in modern manufacturing technique. Improvement in the production of pressed metal parts and stampings, with increased use of better welding methods, will contribute to wider and more efficient processing of fabricated products.

Improved Types

Improved steel of all types is bringing a higher strength-weight ratio and thus lighter-weight products. And, particularly, the improvements developed in the strength, temper and surface of cold-rolled steel and strip have set in motion increasing advancements in fabrication to add more and more new products—large and small.

For more than 200 years steel was rolled into light gauges by hot-rolling, probably one of the oldest methods of rolling steel. In contrast, the cold-rolling of steel is quite a new development, beginning early in this century. Its advantages—better surface and increased strength—are bringing a constant increase in the relative amount of cold-rolled material compared with hot-rolled. Over half of the hot-rolled strip produced in 1939 was coiled and put through continuous pickling lines for further reduction in cold strip mills. The remainder was sold in coils as hot-rolled strip or cut to length and processed by a variety of cleaning and annealing methods. In 1940 nearly 9 out of every 10 tons of cold-rolled sheet and strip produced were rolled on the continuous (tandem) mills. The relative amount rolled on this type of mill will increase with the completion of the new construction scheduled for the next two years.

The closer dimensional tolerances of cold-reduced sheet and strip, plus strength and superior surface not obtainable with the hot-rolled product, have in less than a decade almost completely changed the light-gauge black plate used for tin plating and terne-plating from a hot-rolled to a cold-rolled product. In 1938 hot-rolled back

plate made up four out of every ten tons used, but in 1943 the hot-rolled variety amounted to about 1 ton in every 200. Cold-reduced strip, made largely on continuous mills, accounted for the change.

The cold-rolling process on both sheet and strip may vary from light "skin passes" for tempering purposes to reductions in thickness of 50 to 90 per cent. Although the greater part of light cold-rolled steel is of the low-carbon variety, which is suitable for shaping without breaking, several different tempers and finishes are manufactured to fit the uses to which they are to be put. The temper of the steel depends on such factors as the amount of cold reduction applied and the annealing treatment. Surface finishes of cold-rolled stock, while usually bright, may be obtained as extra bright or blued.

Coatings now used on thin steel may be metallic or non-metallic. In most cases the coatings are applied for the purpose of preventing corrosion or for decoration. Of the metallic coatings, zinc and tin are still most extensively used. All the galvanised sheet produced either by hot dipping or electroplating carries a coating of zinc, the thickness depending on the use to which it is to be put. Although zinc is the commonest coating metal used on light steel for outside structural uses, the container industry uses tin-coated steel, ordinarily known as tin plate. The amount of tin plate used for containers and miscellaneous purposes exceeds the tonnage of galvanised sheet by a large margin.

While the metallic coatings mentioned above are those most commonly used on steel, many others are used for one purpose or another. Progress has been made in the coating of steel sheets with aluminium, and such products will probably be on the market in increasing amounts soon.

Other metals used as coatings include nickel, chromium, cadmium, copper, aluminium, bronze, cadmium-tin alloy, silver, gold and lead, as well as iron and steel themselves. Coatings of different metals are often used at the same time, either for the purpose of securing better adherence of the material or for additional protection. The bright chromium-plated steel used in modern automobile trim is a good example of this. The material has a triple coating —copper, nickel and chromium.

POROSITY IN BRONZE CASTINGS

TWENTY-five rules for reducing porosity and blow holes in bronze castings are given in a recent German technical report by the U.S. Office of Technical Services. In most foundries all over the world, it says, the first charge fills the entire crucible way up into the preheater. This cold charge melts comparatively slowly and the bath stays rather cold for a considerable time. This practice is bound to lead to gases and oxidised metal. It should always be the endeavour of the melter to get a fluid bath as soon as possible and the crucible should not be charged more than half full. After melting down this metal the rest of the charge melts down comparatively quickly. Many founders also prefer to work without a preheater which they believe will induce excessive gassing. However, if the preheater is constructed and used according to specification and if the firing gases are conducted around the crucible and preheater, the latter will benefit the process considerably—if only because it tends to shorten the melting period and to reduce the various chances of deteriorating influences characteristic of the melting down period.

Few foundries realise the danger of porosity resulting from the use of cathode copper in bronze charges; hydrogen absorbed in the cathode during electrolysis is released in the bronze melt, which can be stopped merely by ordering copper cathodes to be melted separately and cast into ingot moulds, thereby eliminating the hydrogen and making the copper a perfect raw material for the final bronze metal.

The report analyses common melting and pouring practices with emphasis on the formation and porosity effect of various gases, particularly hydrogen, carbon monoxide, sulphur dioxide and water vapour. Since reducing gases are more soluble in the bronze bath they are usually more harmful than oxidising gases, but in some methods of melting and pouring the less soluble oxidising gases may become the chief offenders. The presence of gas in bronze does not necessarily cause pores to form. Numerous investigations of alloys and castings as well as practically all possible casting methods have shown that perfectly dense and practically non-porous bronze castings may contain as much gas as weak and porous castings of the same general composition. Unless exceptional gassing has been caused by serious carelessness and negligence, the porosity of a bronze casting is not determined by the amount of gas present in the metal as much as by the kind of gases absorbed during melting, pouring and solidification of the alloy. The report describes briefly European melting fluxes, some of which may offer certain technical advantages. The full report can be obtained from the Office of Technical Services, Department of Commerce, Washington 25, D.C.

Increased Steel Programme Started

PRODUCTION of steel on a greatly increased scale has already started in the British and U.S. zones in Germany. This implements without any loss of time the decision recently announced in the House of Commons by Mr. Ernest Bevin to scale up the permitted figures of steel production for the whole country to a much higher level than was originally proposed. Output will now be raised to a maximum of 10 million to 12 million tons annually in the British and U.S. zones alone, dependent, of course, upon sufficient supplies of coal being available. Permitted output of the British zone hitherto has been 4 million tons, but actual production has lagged far behind that figure. Arising out of the same Anglo U.S. decision, production of other types of industries, including chemicals, is to be substantially raised.

A further important step towards the rehabilitation of Germany as a trading nation was taken on Monday when a plan for closer integration of the Anglo-U.S. zones and for the delegation to Germans of greatly increased powers to shape industrial and commercial policy was announced. Under this a supreme German economic council of over 50, elected by the Governments of the six States in the Anglo-U.S. zone, will have comparatively wide powers of industrial control, aided by a representatively elected industrial executive committee.

NATIONALISATION LOSS

TURKISH industrialisation, based mainly on Government initiative, appears to have been carried out without sufficient consideration of the question of production costs. An example of this is the State Coal and Iron Trust (Zonguldak and Karabük) which employs 31,000 workers and which was purchased by the State six years ago from former foreign owners. Since 1938 the production cost of coal has risen by 500 per cent while coal prices have gone up by only 300 per cent. Thus, the Turkish State is suffering a considerable loss, this being allegedly compensated for by the surplus provided by other nationalised industries. As a result of high production costs, the prices of nearly all home-produced industrial goods are still disproportionately high, even in comparison with high-priced foreign goods

The American African Mining and Exploration Company has acquired mining rights over about 15,500 acres, 38 miles north of Pretoria, where tin mining is expected to start shortly. The production of tin in the Union of South Africa has been constant for some years at 500 tons p.a.

Metal Powder Techniques to be Studied

A RESEARCH project to improve metal powder industrial techniques is being sponsored by the Industrial Research and Development Division of the U.S. Department of Commerce at the Stevens Institute of Technology, Hoboken, New Jersey, which will carry out the research under a six-month "actual cost" contract for which an allotment of $22,500 has been authorised. Stevens Institute will test iron powders furnished by domestic producers to determine the factors affecting physical properties most suitable for widespread industrial application, density and other conditions influencing the utility of the powders will be studied.

Unlike the manufacture of steel parts by forging or casting and machining, powder metallurgy processes involve the hot or cold pressure moulding of metal powders into desired shapes and sizes. They allow the use of a wider range of high temperature alloy compositions than forging or casting. Wartime experiences in the United States and Germany revealed that powder metallurgy techniques, if sufficiently developed, could be used more effectively than forging or casting for making many steel machined parts. Upon completion of the study, Stevens will make a full report of its findings which are expected to be issued by the Department's Office of Technical Services.

U.S. ALUMINIUM BOOM

U.S. Aluminium producers, expecting a serious light-metal surplus, found a demand in 1946 that could not be met even by the output of 600,000 short tons reached by the year end, according to the U.S. Bureau of Mines. The revival in production rate was confined to the latter part of the year; total production of primary aluminium in the United States in 1946 was 409,630 tons, a quantity 2½ times greater than that turned out in any year prior to 1940.

POLISH CHEMICAL INDUSTRY

SATISFACTORY PROGRESS : MANY FACTORIES RESUME

THE progress of the Polish chemical industry during 1946 has, on the whole, been satisfactory; it can be said that the industry was in a position to meet the country's demand for chemicals. During the year 27 chemical factories were restarted while the total number of active works controlled by the Chemical Industry H.Gs. (Centralny Zarzad Przemyslu Chemicznego) rose from 107 at the beginning of the year to 157 at the close of 1946. The breakdown of this total according to the type of output is summarised in the following table:

Industry	Works active	Works inactive	Works total
Inorganic	14	2	16
Artificial fertilisers	11	4	15
Coal derivatives	15	5	20
Explosives	7	1	8
Technical gases	18	5	23
Pharmaceuticals	21	4	25
Rubber and plastics	15	5	20
Fat manufacturing	21	4	25
Paints and varnishes	17	—	17
Applied chemistry	16	—	16
Bureau for Investments and Reconstruction	2	—	2
	157	30	187

The output of chemical products has been steadily rising through the expansion of plant as well as an increase in efficiency of both labour and equipment. Marked increments were registered by the inorganic, coal derivatives, artificial fertilisers and pharmaceutical industries. On the whole the production plan is stated to have been exceeded by 8.5 per cent. The output of principal chemicals at the end of 1946 compared with the position at the close of 1945 is shown in the following table:

	Dec. 1945 (tons)	Dec. 1946 (tons)	Per cent. increase or decrease
Ammonia—soda ...	5,108	7,880	54
Caustic soda ...	860	1,847	114
Calcium carbide ...	2,800	3,404	21
Hydrochloric acid, 100 per cent. ...	481	368.3	−24
Nitrate	5,800	7,488	29
Potassium nitrate ...	883	5,937	572
Superphosphates ...	1,351	7,720	471
Dyes	49.6	124.8	151
Acetic acid (pure) ...	16.32	35.6	118
Spelter	230	443	92
Pigments (dry) ...	100.96	173.1	71
Red lead	63.45	131.6	107
Coal tar products ...	2,212.24	7,478	238
Benzole	1,495.73	2,435.2	63
Explosives	457	811.7	77
Carbon electrodes ...	414	505.2	22
Oxygen (thousand cu. meters)	251	224	−11
Acetylene	55.5	92.5	66

Owing to the expansion of production and decrease of stocks of raw materials the industry had to face serious supply problems. This applied in particular to the supply of pyrites, the deliveries of which are not likely to be substantially increased in the near future. There are similar difficulties in obtaining sulphuric acid, fats, linseed oil, potassium chloride, glycerine, acetone, solvents, colophony, waxes and kaolin. The desire to meet the country's export programe has contributed to the shortage of some raw materials despite the rise of home production. This applies in particular to the output of ammonia-soda, caustic soda and chlorine. Because of these shortages it has not been possible to start production of various potassium and boric compounds. Further difficulties besetting the Polish chemical industry has been shortage of high grade lubricants and such subsidiary materials as barrels, tin boxes and paper bags.

Employment in the industry has been steadily rising and registered a net gain of 70 per cent at the close of 1946. The number of employees of the industry is now nearly 38,000 with the largest increase of labour in the rubber and plastics branches, followed by paints and varnishes. The biggest single employer is the fertiliser industry (8300 persons) the task of which in the rehabilitation of the country's agriculture is tremendous. Because of better pay and working conditions in non-chemical industries, however, there has been big labour losses—about 45 per cent of the employees as at January 1, 1946.

Efficiency indices rose in almost all branches of the chemical industry but particularly in the coal derivatives, pharmaceutical and plastic. The only exception has been the artificial fertilisers industry where a fall in efficiency followed the switch-over to superphosphates at the beginning of 1946.

The national investments budget provides substantial sums for capital renovation and expansion in the chemical industry during 1947. A total credit amounting to Z1.3,000,000,000 (£750,000) is earmarked for distribution among 141 works as follows:

1. Reconstruction of war-damaged factories	27.4 %
2. New construction	16.4 %
3. Expansion of production in active works	39.84%
4. Overhaul and modernisation of plant	16.36%
Total	100.00%

The proposed investments under the head "reconstruction" include rehabilitation of one of Poland's principal pre-war nitrogen fertiliser factories—the State Nitrogen works at Moscice. The work is scheduled

to be completed by the end of 1947. The works is already turning out quantities of formalin and methanol. The start of production of nitrogen compounds and chlorine is expected in the near future. Special importance is attached to the speediest possible reconstruction of the Moscice works in view of the severe shortage of fertilisers at home and the possibility of capturing, at some later date, export markets formerly controlled by the German nitrogen-fixing industry, now scheduled for liquidation. Nearly 12 per cent of the industry's total investment credit is to be allocated to the Moscice works.

At the same time efforts are being made to restore the Gdansk (Danzig) and Szczecin (Stettin) superphosphate works owing to their easy access to overseas sources of phosphates and their favourable position as fertiliser distributing centres in Northern Poland. At the Gdansk works priority is to be given to the rebuilding of the sulphuric acid section; at Szczecin to the superphosphate section; sulphuric acid is to be obtained for the Szczecin works in the first instance from other parts of the country. The nitrogen works at Bobrek are beginning the rebuilding of the calcium carbide section.

In the coal derivatives industry the following reconstruction programme has been put to hand: rebuilding of the cokeries at Zabrze and Zdzieszowice and reconstruction of the Carbon Electrodes Works "Plania" at Raciborz (Ratibor). The "Plania" works are well known throughout the Continent for their electrodes for carbide furnaces. Only a few European producers specialised in this line and it is expected that resumption of their production will contribute to the success of the country's export programme.

One of the most important new works to be built in Poland this year is to be the "Rokita" Standard Chemical Works near Wroclaw (Breslau). The works are to specialise in the production of organic semi-manufactures such as derivatives of ethylene, benzene, naphthalene and anhydride of acetic acid. None of these products has so far been produced in Poland. Initially the works are scheduled to employ 1000 hands, but by 1948 the number of workers should increase to several thousand.

Expansion of production is also to be undertaken in such key works as in the Solvay ammonia-soda works near Cracow and Inowroclaw. On completion of the extension plan, by the end of 1948, the two works should produce 300,000 tons of soda p.a. Expansion of the chlorine and caustic soda sections is planned in the Zabkowice Chemical Works "Elektrycznosc."

Politics and Education

Scientific Workers' Policy

IMPORTANT decisions on the subjects of politics and education, the latter designed to lessen the discrepancy which now exists in the rewards of scientists in educational work and in industry, were taken by the Association of Scientific Workers at its annual council meeting in London last week. The meeting declined by a large majority to take a vote on the question of affiliation to the Labour party, a motion which had been raised by the Clapham branch. Dr. W. A. Wooster said the executive committee was opposed to affiliation, because the association could not pledge itself to any one political party without injuring its internal organisation.

No One Trade Union

A proposal that steps should be taken to form one trade union catering for all professional workers of scientific, technical and kindred grades was heavily defeated, but a resolution asking the T.U.C. to delete all references to the Communist party from the constitution of trades' councils was passed.

Manchester University Branch moved a resolution, which was carried, expressing the opinion that "the future of Britain depends on the constant recruitment of highly trained technical personnel." Proposals incorporated in the resolution included the establishment throughout industry of regular part-time day study, to include students over 21, and the provision of additional funds by the Government to enable universities and technical colleges to offer staff salary rates comparable with rates paid in industry.

The Board of Trade and the Ministry of Supply, the resolution added, should be urged to end the waste and destruction of useful scientific apparatus.

U.K. Tin Position.—Tin figures as at April 1, just issued by the Ministry of Supply, show that at that date Ministry stocks amounted to 9177 long tons, consumer stocks 3930, 285 long tons being in production. Total, 13,390 long tons. Stocks of tin ore in the U.K. at April 1 were 6019 tons as against 5924 tons on April 30.

Scottish Hydro-Electric Scheme.—Work has begun on the construction of the generating station at Fasnakyle, Invernessshire, part of the North of Scotland hydro-electric scheme which will ultimately produce 250 million units of electricity annually for the industrial development of North-East Scotland.

Obituary

We regret to announce the death of MR. PERCY PARRISH, who died at his home at Blackheath on Friday, May 30, 1947. Born at Dewsbury, Yorkshire, on August 26, 1884, he had spent nearly half a century in the heavy chemical industry. After leaving Dewsbury Grammar School, he studied for the chemistry examinations of the City & Guilds of London Institute, meantime familiarising himself with commercial routine, accountancy and shorthand.

At the age of twenty-five Mr. Parrish was appointed general manager of Messrs. John Brown & Co., Ltd., Savile Town, having gained practical experience of works management at the Eaglescliffe Chemical Company's factory. In 1915 he joined the South Metropolitan Gas Company, and became manager of the ammonia and acid works at East Greenwich, which appointment he held at the time of his death.

Mr. Parrish was responsible for the design of sulphate of ammonia and sulphuric acid plants in many parts of the world, and contributed widely to the technical press.

The late Mr. P. Parrish.

He was a contributor to THE CHEMICAL AGE and reviewed in its columns the yearly progress of the heavy chemical industry. In 1924 he published "Design and Working of Ammonia Stills," and this was followed two years later by "Artificial Fertilisers." Later editions of the latter work appeared in 1938 and 1947 under the title "Calcium Superphosphate and Compound Fertilisers." Mr. A. Ogilvie, M.I.Mech.E., collaborated with Mr. Parrish in the writing of these books on fertilisers.

Mr. Parrish was a Fellow of the Royal Institute of Chemistry, Fellow of the Chemical Society, Member of the Institution of Chemical Engineers, Member of the Institution of Gas Engineers and Fellow of the Institute of Fuel. He held a very high reputation in his profession.

D

B. A. Meeting

Chemistry Section Programme

THE preliminary programme of the 109th annual meeting of the British Association, which is being held in Dundee from August 27 to September 3 inclusive, has now been issued.

The sessions of the Chemistry Section (B) will be held in the Chemistry Department of University College. The presidential address will be by Dr. J. L. Simonsen on "Science and the Colonies" on Thursday, August 28, followed by a discussion on insecticides. On Friday penicillin and other anti-biotics will be discussed, and on Monday, September 1, the chemical resources and industries of Scotland. The use of tracer elements, stable and radioactive, in biology and in chemistry is the subject for Tuesday, September 2.

The association meetings will be opened by the presidential address by Sir Henry Dale on "Science in Peace and War" on Wednesday, August 27. Other functions include a reception by the City and Royal Burgh of Dundee on Thursday, August 28, at 8.15 p.m. in the Caird Hall, garden parties, and a dance on Friday, August 29. Excursions to the surrounding countryside are being arranged, as well as works visits, including one to Messrs. John Moncrieff of Perth (glassworks), and to jute and paper works.

During the latter part of the meeting an exhibition of Dundee industries, old and new, will be on view in the Caird Hall.

The first shipment of Siamese tin ever to be received in the United States, consisting of 50 tons of the metal, arrived in the United States this week aboard the *Longview Victory*, the Tin Sales Corporation, agent for the (U.S.) Reconstruction Finance Corporation, has announced. The shipment will be followed by larger cargoes representing allocations of Siamese tin to the United States under Government contract.

Pensioner for 45 Years

Mrs. E. S. McNab, who died recently at the age of 97, had been an I.C.I. Metals Division pensioner for 45 years, having retired in 1902. In 1862, when only 12 years old, she started work in George Kynoch's factory where she tinfoiled percussion caps; within 10 years she had become forewoman. During 1884, when the trade was at its peak, no less than 449 million caps were produced under her direct supervision.

MR. ANTHONY SUTCLIFFE, editor of *The I.C.I. Magazine*, who died a few weeks ago, was responsible for the re-appearance of that publication in January of this year after a war-period suspension.

LETTER TO THE EDITOR

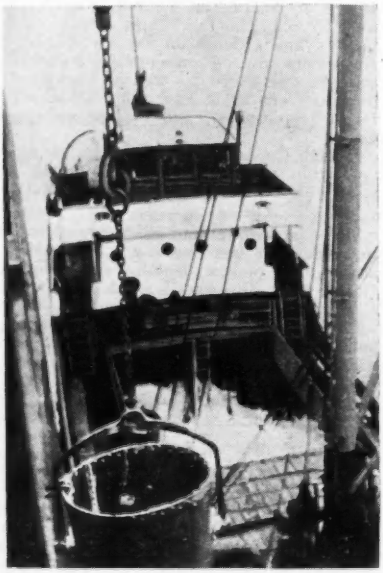
Unloading Chemicals

DEAR SIR,—I think the enclosed photograph might be of interest to your readers. The photograph shows a Dutch vessel, *The Coeta,* in Ipswich docks with a cargo of ammonia for a chemical factory. At first the grab method was used for unloading but the ammonium salts attacked the metal and the less costly steel bucket was adopted in its place.

In this connection an engineer makes the following suggestion. "Why not construct an unloading device from concrete with a wire basket as the framework, then the expense would be cut down a great deal and life of the appliance prolonged?" There is a certain make of concrete on the market which might lend itself to unloading corrosive chemicals.—Yours faithfully,

CHRISTOPHER ELLIOTT,

"Hope Villa,"
Fair Close,
Beccles, Suffolk.



Steel Board Visit

Sir Archibald Forbes, chairman of the Iron and Steel Board, together with Mr. A. Callighan, Mr. Lincoln Evans, Mr. G. H. Latham, Mr. R. Mather, Sir Wilfrid Ayre and Sir Alan Barlow, members of the Board, will visit certain Scottish steel works on June 3, 4 and 5, in order to obtain first-hand information.

A CHEMIST'S BOOKSHELF

The Art of Soap Making. A. Watt. The Technical Press Ltd. 1946. p. 227. Appendix 68. Price 10s. 6d.

Though the present posthumous edition is the 13th revised and enlarged impression of this work, one looks in vain for any reference to modern processes. High pressure fat splitting without catalyst, continuous distillation of fatty acids, soap powder manufacture by spray drying are some of the more conspicuous omissions. In the chapter on the recovery of glycerine, which was specially added to this volume, we read "spent lyes are evaporated . . . by fire heat or dry steam . . . in shallow pans with sloping bottoms . . . or evaporation *in vacuo* might also be effected, but would be more expensive." Multiple effect evaporation and continuous distillation with fractional glycerine condensation are completely omitted.

The bulk of the volume is made up of practical soap kettle recipes, without however, attempting to touch on the physico-chemical problems involved. The illustrations include, for instance, a single line drawing of a soap cutting wire and of a "short-handled ladle" but there is not a single photograph of any machine or plant used in the soap industry. Nor, for instance, does a soap plodder or cooling press appear in the index or anywhere else.

Despite these omissions, this book will find its place on the shelf in many a soap factory for the practical hints it provides.

M. K. SCHWITZER.

Proposed I.C.I. Factory near Liverpool

The largest factory of its kind in Europe, and perhaps in the world, is to be erected by Imperial Chemical Industries, Ltd., which will, in the first instalment of building, cost £1,000,000 and eventually employ 3000 men, producing copper tubes and similar goods, primarily for export. The Liverpool Corporation is to sell to I.C.I., on lease for 999 years at a peppercorn rental, a 50-acre site for £75,000—on the new Corporation trading estate at Kirkby—and also to grant an option, for ten years, to take a similar lease of 50 acres more at the rear, the company paying £7500 for this option. The site has 900 yards' frontage to the East Lancashire Road. The erection of the new factory must start within five years. The Corporation will indemnify I.C.I. against any development charge which may be levied under the provisions of the Town and Country Planning Bill. Vacant possession of the land will be given subject to the existing agricultural tenancies, and I.C.I. will be responsible for the payment of any compensation due.

Home News Items

Stationery Office at Bristol.—The Stationery Office announces the opening of a new sale office at Tower Lane, Bristol, 1.

Bottle-filling Machines. — The Barker Bland Engineering Co. is marketing two new bottle-filling machines, one hand-operated, weighing only 30 lb., the other automatic, weighing 10½ cwt.

Prices of Oils and Fats.—The Ministry of Food announces that no changes will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the four weeks ending June 28, 1947.

Works Closure Investigation.—It is understood that the decision of the British Oil and Cake Mills to close down the Rockvilla Works, Glasgow, this month, is to be investigated by the National Union of General and Municipal Workers. More than 50 employees, members of the union, are affected. The official reason for closing down by the firm is lack of raw material; but it is alleged that the company has considerable reserves of raw materials in store in different parts of Glasgow and elsewhere. Production is to be transferred to Greenock.

Development Schemes Delayed.—The second report of the select committee on estimates, published last weeek, says that the progress in factory construction in the development areas "gives some cause for concern." In particular, shortages of bricks, and later of steel, have seriously delayed the construction of new factory premises. "Whereas the Board of Trade estimate the total potential employment to be provided by the new factories now approved as 149,000, yet on March 31, 1947, employment for only 3251 had, in fact, been provided," it says.

Prosperity Depends on Co-operation.—The future prosperity of Britain depends on the strengthening of co-operation between the academic school and the chemical industry to a very large extent, Professor A. R. Todd, Professor of Organic Chemistry at Cambridge, said at the last of the commemoration meetings held in Glasgow University to celebrate the bicentenary of the Chemistry Department.

U.K. Light Metals Statistics, March, 1947.—U.K. aluminium production figures for March are made up as follows: Virgin (all unwrought forms) 2454 long tons, secondary ingot (excluding recovery at Government depots from crashed aircraft) 5092 long tons, giving a total of 7546 long tons.

"Enterprise Scotland, 1947."—The Scottish exhibition "Enterprise Scotland, 1947," will be held at the Royal Scottish Museum, Edinburgh, from August 25 to September 30.

Gas Development at York.—A gas development scheme to cost £162,000, which will take about two years to complete, has been started with Government approval at York, to be carried out by the United Kingdom Gas Corporation. At the present York city gasworks there will be erected two water-gas plants with a combined capacity of four million cu. ft. of gas per day, making a total output of 10¼ million cu. ft. a day.

Coal Economy at Gasworks.—The gas industry has continually increased its use of oil for gas-making in order to save coal, declared Mr. J. R. W. Alexander, general manager of the British Gas Council, at a British Industries Fair luncheon. During the last three years, he said, it had raised its consumption of oil by 110 per cent and this would be increased to 190 per cent during the current year, meaning that gasworks would save 6½ million tons of coal by using instead 216 million gallons of oil.

British Copenhagen Exhibition.—Arrangements have been made, with the approval of the Government and the Danish Government, to hold an all-British exhibition in Copenhagen in September, 1948. The exhibition will be organised by the British Import Union of Copenhagen in collaboration with the Federation of British Industries, as was done in the case of the successful British exhibition in Copenhagen in 1932. As soon as the plans and other information for intending exhibitors are completed, a further announcement will be made.

Industrial Radiology.—A symposium on "Methods of Crack Detection" is being arranged by the industrial radiology group of the Institute of Physics in London on July 18 and 19. An introductory address is to be given by the vice-chairman, Mr. W. Betteridge, followed by short papers on "Radiological Methods" and "Visual, Etching and Magnetic Methods"; and at a later stage there will be papers on "Eddy-current Methods" and (by Mr. D. O. Sproule) on "Crack Detection by Supersonic Methods." Provisional arrangements include visits to X-ray and destructive testing departments of London firms and possibly a dinner. Non-members may obtain fuller details from the Institute of Physics, 47 Belgrave Square, London, S.W.1.

Personal

MR. L. A. SIM, of L. A. Sim & Co., has been appointed a director of Jeyes Sanitary Compounds Co., Ltd.

MR. FREDERICK STATHAN, is retiring after 46 years' service from Messrs. Lever Bros., Ltd., Port Sunlight, where he is manager of the estimating department.

MR. C. PAINE, research manager of the Dyestuffs Division of I.C.I. (Pharmaceuticals), Ltd., has recently been appointed to the board of the Dyestuffs Division.

SIR HENRY DALE, president of the British Association, and chairman of the scientific committee for Germany, has just concluded a visit to the British zone and to Berlin.

MR. F. H. GERARD, who has been chairman of Gerard Brothers, Ltd., for the past 17 years, has now resigned. His successor is Mr. H. Simpson who has served the company for 50 years.

MR. MALCOLM DUNBAR, of L. Oertling, Ltd., has resigned the chairmanship of that company. His successor is MR. J. ROCK COOPER who has been on the board of directors for the last three years.

PROFESSOR R. A. PETERS and PROFESSOR E. K. RIDEAL have been appointed to an advisory council for the Military College of Science; it will advise the War Office on Scientific and technical education.

MR. NOEL G. S. COPPIN has been appointed secretary of the Plastics Division of I.C.I. in succession to Mr. L. W. Codd who has recently been transferred to London.

MR. C. TYLER, B.Sc., Ph.D. (Leeds), A.R.I.C., has been appointed Professor of Agricultural Chemistry and MR. E. L. CROSSLEY, B.Sc. (London), F.R.I.C., Professor of Dairying, at Reading University as from September 30, 1947.

LT.-COLONEL BRIGGS, a former chairman of Lever Brothers, is to be a member of the committee of five appointed by the Minister of Labour and National Service to inquire into the railwaymen's application for an increase in wages and a reduction in working hours.

MR. THOMAS TURNER, for many years Professor of Metallurgy at Birmingham University, and Mrs. Turner, on Sunday celebrated their diamond wedding. Mr. Turner (86) and his wife (83) were married in Edinburgh. Several of their children have carried on their father's scientific tradition.

MISS JOAN D. PEDEN, aged 26, of Becontree Road, West Derby, Liverpool, a member of the Liverpool city analyst's staff for the past five-and-a-half years, has been appointed deputy county analyst for Staffordshire. A B.Sc. of Liverpool University, Miss Peden is believed to be one of the youngest of the few women who have attained an executive post in this work.

At the recent annual general meeting of the Association of British Insecticide Manufacturers, the following were elected as the officers for the ensuing year. *chairman*, Mr. H. J. Jones (Hemingway & Co., Ltd.), *vice-chairman*, Dr. J. R. Booer (F. W. Berk & Co., Ltd.), *hon. treasurer*, Mr. R. V. Craven (W. J. Craven & Co., Ltd.). Executive committee: Mr. E. T. Buggé (Buggés Insecticides, Ltd.), Mr. R. V. Craven (W. J. Craven & Co., Ltd.), Dr. E. Holmes (Plant Protection, Ltd.), Mr. J. S. Mitchell (Murphy Chemical Co., Ltd.), Dr. J. H. Reid (British Nicotine Co., Ltd.), Mr. T. A. Robertson (Plant Protecton).

DR. ROBERT PRICE RUSSELL, who delivered the Cadman Memorial Lecture ("The Organisation of Industrial Research") at the Royal Institution on Wednesday, is a leading authority on the chemistry of petroleum and its derivatives, in which he has initiated a great deal of modern technique. As president of the Standard Oil Development Co., the research section of the Standard Oil Co. of New Jersey, Dr. Russell directed the development of the fluid catalytic cracking process, which greatly increased the production of 100 octane gasoline; another of his contributions to war production was a very effective oil smoke generator.

Mr. A. F. Girvan, who, as announced last week, retires this month after 35 years' service with the Metropolitan Water Board.

NEXT WEEK'S EVENT

MONDAY, JUNE 9

Federation of British Industries (Industrial Research Committee). F.B.I. Council Room, 21 Tothill Street, S.W.1, 6.15 p.m. Mr. Robert Price Russell: "The Organisation of Industrial Research—I."

Overseas News Items

Canada's U.S. Coal Consumption.—Canada is still the largest consumer of U.S. coal. Bituminous coal and anthracite shipments from the U.S. to Canada in 1946 amounted to 56 and 69 per cent of total U.S. coal exports.

New Anglo-Belgian Exhibition.—An exhibition will be held in the Salle de la Madeleine, Rue Duquesnoy, Brussels, from September 4 to 9, to show the products of British manufacturers to buyers for the European markets. The organisers are H. and H. Trading (London) Ltd., of 5, Copthall Buildings, E.C.2.

Insecticide Mortar.—An insecticide mortar for spraying tall orchard trees has been developed by the New York State Department of Labour in conjunction with a fireworks manufacturer. In the original experiment a six-inch pipe mortar loaded with DDT and black powder was used. Since then cartridges have been made which will burst at any height up to 1000 ft.—but most are set at 45, 60 and 90 feet.

Shortage of Radioactive Isotopes.—Medical research work at Montreal's McGill University has been hampered because the United States Atomic Energy Commission regards Canada as a " foreign country " and will not permit export of radioactive isotopes, Dr. R. J. Gross, of the McGill Department of Anatomy, told the annual meeting of the American Association of Anatomists.

New Aluminium Firm Formed.—The formation of a $10,000,000 aluminium company in Brazil has been announced by officials of Aluminium, Ltd., of Canada. The new concern, Aluminio do Brasil, S.A., will be jointly owned by Aluminium, Ltd., and Francisco Pignatari, Brazilian industrialist. Plans of the new firm provide for the development of an integrated aluminium industry in the State of Sao Paulo, Brazil.

Silver Brazing. — Consistently strong silver brazes can be produced without detriment to the metal or danger to the brazing operator by using a control flux developed recently by the Navy Department Bureau of Aeronautics, according to a report by the U.S. Office of Technical Services, Department of Commerce, Washington 25, D.C. The composition, properties and experimental development of the flux are described, including a summary of some patents on silver brazing fluxes and a table of results obtained in tensile tests of joints made with both the control and commercial fluxes.

Canadian International Trade Fair. — Applicants for floor space at the Canadian International Trade Fair, to be held in Ottawa next year (May 10-June 22) should communicate with the Canadian Government Exhibition Commission, 479 Bank Street, Ottawa, before July 15 this year.

Iron Ore Nearly Doubled.—Canadian iron ore production in 1946 showed a marked increase over the previous year, according to a report issued by the State Division of Mines. Production for the year totalled 428,354 net tons, with a value of $1,061,956, compared with a 1945 production of 240,917 tons valued at $883,434.

Argentine Industry Growing.—An annual production of 40,000 tons of caustic soda, compared with the present annual output of 10,000 tons is part of the Argentine Government's industrialisation plan. Other targets are: sodium carbonate, 25,000 tons; arsenate of lead, 500 tons; barium chloride, 800 tons; citric acid, 400 tons; red lead, 1000 tons; litharge, 800 tons; zinc oxide, 3500 tons.

U.S. Streptomycin Production.—By January next, U.S. output of streptomycin is expected to reach one million grammes monthly, *i.e.*, twice the present output. The retaining of export control measures has been recommended. The Eli Lilly Co., of America, has recently completed the conversion of a former aircraft plant in Indianapolis for the production of penicillin and streptomycin.

Mexican Trade Directory.—The publication is announced of an industrial directory of Mexico, sponsored by the Confederation of Industrial Chambers of Mexico, covering all types of industries. Included in its 1024 pages is a list of all Mexican industrial companies, their addresses, names of managers and executives. The address of the publishers is: Publicaciones Rolland, S. de R.L., Plaza de la Republica No. 6-407, Mexico City.

Plan for Argentine Gas Industry.—Natural gas will account for 82 per cent of all gas consumed in Argentina by the end of 1951, according to the five-year plan announced for the gas industry. At present most of the gas consumed is manufactured from imported coal. The plan calls for construction of a gas pipe-line from the oilfields at Comodoro Rivadavia to Buenos Aires by 1949, and provides for a total expenditure of 271,000,000 pesos, an increase from 330,000 to 700,000 in the number of gas consumers, and a reduction in the price of gas.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

HEMCO, LTD., London, E., scientific instrument dealers. (M., 7/6/47.) April 23, £300 debenture to A. Nathanson, London; general charge. *—. December 31, 1946.

Company News

Gerard Brothers, Ltd., is paying a 12½ per cent dividend on ordinary shares, plus a 5 per cent bonus to commemorate the jubilee of the company.

The **Lawes Chemical Co.** is making a new issue of 201,320 ordinary 10s. shares at 12s. 6d. each, payable in full on acceptance. For every five 7 per cent non-cumulative participating preference or ordinary shares held on May 27, shareholders will, as far as possible, be offered three new shares.

Crompton Parkinson is maintaining the dividend on its ordinary and "A" ordinary stock at 7½ per cent, less tax, for the year ending September 30 next. The payment for 1945-46 was followed by a final dividend of 7½ per cent and a bonus of 7½ per cent, making 22½ per cent for the year. The current dividend is payable at June 30.

Park Gate Iron and Steel Company will pay a dividend of 10 per cent, less tax, on its £1 million ordinary stock units of 10s. for the year ending March 31, 1947, representing an increase of 2 per cent on the previous year. Gross profit totalled £218,411 as against the 1946 figure of £210,001. Net profit is given as £80,411.

Glaxo Laboratories, Limited, has declared an interim dividend of 4s. 6d. per 10s. unit of ordinary stock, equivalent to approximately 3 per cent upon the capital employed in the business which the ordinary stock of the company represents. The dividend will be paid, less tax at 9s. in the £, on July 31, 1947.

The Manganese Bronze and Brass Company's profits for 1946, before providing for taxation, amounted to £127,977 compared with £81,407 in the previous year. A final dividend of 22½ per cent is being paid on the ordinary shares, making 30 per cent for the year. After making provision for dividends and taxation, there will be a surplus of £34,766 as against £15,765 for the previous year.

At the twentieth ordinary general meeting of the **British Match Corporation, Ltd.,** the chairman announced that the yield from investments in subsidiary and associated companies during the year ended April 30 was 10.189 per cent; the return for the previous year was 10.148. Other points of interest: Match distribution in Britain is on a basis of 66⅔ per cent of the pre-war standard; at one time during the war the percentage figure dropped to 45; the supply position of raw materials is "getting worse and worse."

Boots Pure Drug Company, Ltd., announces that the net profit for the year ended March 31, 1947, amounted to £756,470 (£619,459) after providing for E.P.T. and Profits Tax and £477,550 (£391,000) for Income Tax Schedule "D." A payment of a final dividend on the ordinary shares of 20 per cent (15 per cent), less tax, payable September 30, 1947, will be made to those shareholders on the register at May 29, 1947, making a total dividend for the year of 40 per cent (35 per cent). Aggregate net profits of the group for the year ended March 31, 1947, amounted to £1,063,830 (£826,241) after providing for E.P.T. and Profits Tax and £898,774 (£702,500) for Income Tax Schedule "D." All figures are subject to audit except those in parenthesis which refer to the previous year.

Timothy Whites & Taylors, Limited, is advised by the company's auditors that a few weeks will be required to complete the audit of the accounts for the year to December 28, 1946. Information available to the company and confirmed by the auditors indicates that the profits for that year, after deducting E.P.T. at the reduced rate of 60 per cent applicable, will be appreciably larger than those of the previous year. A second interim dividend of 25 per cent actual, less tax, has accordingly been declared upon the ordinary shares, making with the interim dividend already paid a total of 32½ per cent actual, less tax, in respect of the year ended December 28, 1946. The company does not propose to recommend the payment of a further dividend in respect of that period. All transfers received up to the close of business on May 30 will rank for the dividend, and warrants will be posted on June 20, 1947.

New Companies Registered

John Hamilton & Co. (Pharmaceuticals), Ltd., 16 Watson Street, Glasgow Cross, Glasgow. Capital £15,000. Manufacturers, importers, exporters of chemicals. Directors: J. W. Hamilton and G. Smith, of Glasgow.

Vocalzone Company, Ltd. (435,868).—Private company. Capital £5000 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, medicines, etc. Directors: W. Lloyd, J. M. Lloyd and Mrs. Marion L. Lloyd. Registered office: 12 Lammas Street, Carmarthen.

Chemical and Allied Stocks and Shares

EARLIER in the week stock markets were quiet, a cautious attitude prevailing, awaiting the news from India, but buyers were more in evidence later, leading industrials being particularly favoured. Demand for the latter was attributed partly to reinvestment buying on the part of Argentine railway stockholders who had decided not to await the cash distributions, the basis of which has now been announced following the sale of the railways to the Argentine Government.

Chemical shares remained well to the fore, fresh buying carrying Monsanto Chemicals 5s. ordinary to the new high level of 65s. which compares with the price of 42s. 6d. at which they were recently issued. Imperial Chemical were also in demand and have risen further to 52s. 1½d. According to some market views the latter should stand around 60s. on which basis the yield would be 3¼ per cent (last year's total payment was 10 per cent) a yield which would not be out of line with the average return on other leading industrial shares. Fisons remained at 68s. pending the financial results, while Lawes Chemical 10s. ordinary were 16s. Major & Co.'s 2s. ordinary were 6s. Greeff-Chemicals Holdings 5s. ordinary have changed hands up to the new high level of 19s., the dividend being raised from 12½ to 17½ per cent. In other directions, William Blythe 3s. shares changed hands around 17s. B. Laporte have eased to 107s. 6d. following the unchanged 12½ per cent payment. British Glues & Chemicals 4s. ordinary eased slightly to 19s. 9d. Shares of companies with plastics interests came in for less attention, British Xylonite reacting to £13¾, while Erinoid were 18s. 6d., and British Industrial Plastics 10s. 9d.

Dunlop Rubber have been prominently active with an advance to 80s. 6d. the full accounts emphasising the strength of the position. United Molasses at 56s. 6d. also moved higher following publication of the full results, and Associated Cement (77s. 9d.) remained under the influence of the favourable remarks regarding the cement industry made by the committee of inquiry. British Plaster Board have been steadier around 34s. awaiting the financial results. British Aluminium at 49s. 10½d. turned easier, Borax Consolidated were 61s. 3d., but British Oxygen have been favoured around 108s. 9d. Lever & Unilever were little changed at 55s. 9d. General Refractories held their rise to 26s. 1½d., Amalgamated Metal kept at 21s., and Imperial Smelting were 21s. 4½d. Paint shares remained in favour, stimulated by the higher dividend of Goodlass Wall, and the 10s. units of the last-named company rose afresh to 45s. 3d. Distillers advanced to 148s. 6d. on dividend hopes.

Iron and steels tended to be firmer and William Beardmore were a strong feature, rising to 41s. 3d. on further consideration of the results. United Steel were 24s. 1½d., Stewarts & Lloyds 54s. 7½d., and Guest Keen strengthened to 48s. Park Gate Iron rallied to 13s. 4½d. following the dividend increase. Tube Investments remained around £7 helped by the latest developments in connection with the company's aluminium interests. Colliery shares have again come into favour on current market estimates of break-up values. Stavely were good again at 68s. 3d., and Powell Duffryn at 27s. 3d. were helped by the debenture plan. Textiles have been fairly steady with Bleachers changing hands up to 16s. 6d. on hopes that the forthcoming results may show resumption of dividends. Boots Drug displayed steadiness at 64s. 3d. on the dividend, although Timothy Whites have come back to 54s. 6d. Sangers were 39s., and Griffiths Hughes no better than 60s. Glaxo Laboratories went back to £27¾ following the interim dividend announcement. Oils became firmer with Shell (£5¼) attracting attention on higher dividend hopes.

British Chemical Prices

Market Reports

NO changes of importance have occurred in the chemicals markets during the past week and conditions generally are as active as the supply position permits. The movement to the main industrial users has been maintained on a good scale with perhaps a slight improvement in the alkali position. Values are firm and quotations unaltered. Most of the coal tar products are well sold ahead and spot transactions are difficult to negotiate.

GLASGOW.—During the past week demand in both the home and export trade has been heavier than for some time, particularly noteworthy in the home trade has been the demand for fluorspar and zinc oxide. The supply position is steadily improving and deliveries against contracts and orders for all classes of chemicals have been comparatively good. Export inquiries are still brisk, particularly for sulphuric acid, formaldehyde, alkalis, solvents and plasticisers. A number of orders have been booked, and the general outlook for the future is steadily improving.

TECHNICAL PUBLICATIONS

"We Live by Exports" is the not very enterprising title of 24 pp. booklet (4d.), illustrated by picture charts, by which the Board of Trade in co-operation with the Central Office of Information is seeking to explain the present shortages of most commodity goods and the need for greatly increased export trade.

The facts, figures and arguments contained in the booklet—says the Central Office of Information—are well known to all students of political economy, but they are not so well understood by the average consumer who is continually asking, after two years of peace, "Why can't we have the goods we want and why all this insistence upon exports?" Answers to this and other questions follow a foreword by the President of the Board of Trade (Sir Stafford Cripps), and at the end comes a "quiz" on the need for exports. Exports—it is shown—must now pay for well over three-quarters of our import needs, instead of for just over half, as before the war. By the end of 1946 we had achieved a volume of exports equal to that of 1938. The target for the end of 1947 is to raise exports 40 per cent above those of 1938 and the further target is 75 per cent above 1938 exports.

Several of the important new facts which have been added to the body of information concerned with food chemistry by the specialist research staff of the Ovaltine Research Laboratories are now made public in the annual report (1946) just issued by the laboratories. This summarises useful advances secured in co-operation with other bodies in such subjects as riboflavin and nicotinic acid in cereals and vitamin contents and methods of control and accurate assaying.

A new use of tungsten carbide, which alloyed with cobalt, has already proved its exceptional durability in cutting tools, is the mixture of fused carbide particles mixed with a fluxing agent and contained in a steel tubular welding rod. The merits of this new method, which Murex Welding Processes, Ltd., are marketing as "Tubex" are described in the booklet M.39 which the company is now issuing. Other modern welding achievements of exceptional size and intricacy are described and illustrated in the current issue of *The Welder* (No. 91) issued by the same company.

The Farrar Boilerworks, Ltd., has marked the celebration of its diamond jubilee by issuing a special catalogue contained in a permanent and distinctive folder cover, which will make a useful repository for the further technical and trade information the company is now preparing on chemical plant, air receivers and welded, riveted and pressed work.

OFFICIAL NOTICES

Taking effect as from June 9, the following changes in export licensing controls have been announced by the Board of Trade. Among the goods affected by the Order are the following:—

Additions to the schedule of goods requiring export licenses:—

Group 13: Amidopyrine, arecoline and its salts, calcium borogluconate, carbromal, folic acid and its salts and preparations, papaverine and its salts, phenazone, thyroid, totaquine.

Removals and *modifications*:

Group 3: Metallic resinates have been added to the exceptions to the soaps heading, which should now read:—

"Soaps of all kinds (other than metallic resinates and scourers containing less than 6 per cent by weight of anhydrous soap)."

Group 5: Mica, micafolium, micanite and mycalex may in future be exported without licence. Sulphur and mixtures containing sulphur are also freed from export licensing control.

Group 13: The following may in future be exported without licence:—

Cinchonidine and its salts and preparations, ergot, maltose, mepacrine and its salts, monoethanolamine and its salts, pamaquin, peptones, silver compounds, sorbitol, extracts of cascara sagrada, preparations of cinchona, preparations of cinchonine and its salts, preparations of colchicum,, preparatios of quinidine and of quinidine salts, preparations of quinine and of quinine salts.

Trade with Japan

The following Orders signed on May 28, 1947, relax restrictions on private trade with Japan:—Trading with the Enemy (Authorisation) (Japan) Order, 1947 (S.R. & O. 1947 No. 1031); Trading with the Enemy (Transfer of Negotiable Instruments, etc.) (Japan) Order 1947 (S.R. & O. 1947 No. 1032); Trading with the Enemy (Custodian) (Amendment) (Japan) Order 1947 (S.R. & O. 1937 No. 1033).

The general effect of these Orders is to permit trade with the Japanese State and private traders carrying on business in Japan, and to remove Board of Trade and Custodian control from any money or property arising in consequence of this authorisation. Japanese money and property in the United Kingdom at the date of the Orders and income arising therefrom continue under Board of Trade and Custodian control. The issue of these Orders is in line with similar action taken in the United States after consultation with the United States Military Authorities in Japan.

EDUCATIONAL

SITUATIONS VACANT

APPLICATIONS are invited for the position of Assistant Sales Manager by an important firm of organic and inorganic chemical manufacturers. The position offers considerable scope for a man with personality, tact, and knowledge of the commercial side of the chemical industry. Applicants should be aged 30–35 and hold a good honours degree, or its equivalent, in chemistry. Box No. 2470, THE CHEMICAL AGE, 154, Fleet Street, E.C.4.

CHEMICAL Engineer for Works near London dealing in reconditioned Chemical Plant. Must be experienced in buying and selling machinery—handling enquries, etc. Reply stating qualifications and salary to Box No. 2472, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMICAL Engineer required for plant design and layout work includes preparation of flow sheets, material and heat balances, unit design and preparation of line diagrams and complete arrangements. Primary qualifications are a sound knowledge of chemical engineering methods and ability to work hard and methodically. Apply, Managing Director, ALUMINIUM PLANT AND VESSEL CO., LTD., Wandsworth Park, London, S.W.18.

CHEMICAL Engineer wanted for old established chemical works and oil refinery with several factories in East London. Must be of good education, fully qualified and about 25–30 years of age. To be personal technical assistant to director in charge of construction, development and maintenance of plant, etc. The position will be a permanent one with a good salary and prospects. Reply giving full particulars and stating education, qualifications, experience, etc., and salary required to Box No. 2465, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMIST (B.Sc. Honours or equivalent), with vision and initiative, wanted for London Central laboratory of group of firms manufacturing well-advertised household specialities (modern detergents, insecticides, etc.). Write stating experience, age, salary required. Confidential to Box No. 2475, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

SITUATIONS VACANT

CHEMIST required with some experience of Mastics, Plastic Compounds and Finishes; required for South Coast laboratory. Minimum salary, £8 per week. Apply Box No. 2476, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

EXPORT Sales Manager required by reputed firm manufacturing large quantities of modern detergents and other household specialities based upon scientific research. Will applicants knowing one to two foreign languages and having experience in the export trade (chemicals especially), state age, salary, previous experience. Write Box No. 2474, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

IMPERIAL CHEMICAL INDUSTRIES LIMITED require Metallurgists with First- or Second-class Honours Degrees, for work in connection with Research, Development, Design and Maintenance of Chemical plants in the Merseyside area.

Successful candidates will be required to specialise on materials of construction; to study the factors influencing the selection of materials for specific purposes and carry out any research work necessary in connection with these. They will also be required to investigate works' problems and to advise the Engineering Design Staff on materials of construction for new plants. They will be expected to keep abreast of current developments in the metallurgical field and also on non-metallic construction materials such as plastic chemical stoneware.

Salary according to age and experience. Write to The Staff Manager, **IMPERIAL CHEMICAL INDUSTRIES LIMITED**, General Chemicals Division, Cunard Building, Liverpool.

OLD-ESTABLISHED progressive group of factories, with wide interests, engaged in specialised printing and the manufacture of nationally advertised articles, wish to engage an intelligent Chief Chemist (B.Sc. Hon. or equivalent) with varied experience, mainly in organic chemistry. Permanent progressive executive position. Applications, which will be treated in confidence, stating details of career, references, age, experience and salary required, to Box No. 2473, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PLANT Chemists urgently required for Process Plant Operation by large company operating in the Middle East. Applicants need not be Graduates but should have had a chemical training up to Inter. B.Sc. or National Certificate Standard with experience of shift work in either a gas, coke oven or chemical works. Age not over 30. Salary in sterling between £540 and £600 per annum, plus generous allowances in local currency, with free furnished bachelor accommodation, passages out and home, medical attention, also kit allowance and Provident Fund benefits. Apply, stating age, qualifications and experience, etc., to Dept. F.22, Box No. 2435, THE CHEMICAL AGE, 154, Fleet Street London, E.C.4.

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AIR Receivers, 40, dished ends, 4 ft. 6 in. by 22 in. dia. tested 120 lbs. hydraulic, £5 each inspected Hatcham Road, S.E.15. THOMPSON & SON (Millwall) Ltd., Cuba Street, Millwall, London, E.14.

APPROXIMATELY 4 tons Copper Sulphate Commercial, Fine Gran. Price £30 per ton. Sample on request. Box No. 2466, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

BOXES for disposal. We may have the very box you are looking for. List free on application. WOOD CONSTRUCTIONS, 39, Water Lane, Brixton, London, S.W.2. 'Phone: Brixton 1231, 5661.

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Steam-heated Drying Oven by Ballard, approx. 5 ft. 6 in. by 5 ft. 3 in. by 3 ft. 6 in.

4 ft. dia. by 12 in. deep Fixed Pan Edge Runner Mill by James Evans & Co., fitted with plain and cogged roll underdriven through bevel gearing from fast and loose pulley, 24 in. dia. by 4½ in. face. Rolls, 2 ft. 2 in. dia. by 9 in. face, pan mounted on cast-iron legs.

Horizontal enclosed drum-type Steam-jacketed Mixer, 3 ft. 9 in. dia. by 8 ft. long, heavy type paddles on glanded shaft, driven from pulleys through worm gearing 2½ in. dia. bottom run-off.

Vertical Aluminium Mixer, 5 ft. 9 in. dia. by 3 ft. 2 in. deep, with loose aluminium covers. Horizontal glanded aluminium shaft and paddles in glanded bearing.

Two Horizontal Cylindrical T.E. Steam-jacketed Mixers or Fat Melters, 6 ft. long by 3 ft. 9 in. dia. of riveted construction, $\frac{7}{16}$ in. plate, jacket ¼ in. plate, jacketed for three-quarters of circumference. Fitted fin-type blade agitator on shaft 2½ in. dia., carried in glanded bearings. Shaft extension fitted with m/c bevel gear 21 in. dia. and supported by outer bearing, mounted on bracket integral with shell. Vessel fitted with manhole 21 in. dia. with swing lid, secured with swing bolts, also manhole 11½ in. dia.

Werner Pfleiderer Mixer by Baker Perkins, double-trough type "Z" blades, diff. speeds, C.I. and M.S. construction, 2 ft. 8 in. by 2 ft. 9 in. by 2 ft. deep. Steel grid covers, hinged hand-tilting handle, chain and sprocket.

No. 1 Periflo Mill by the S.O.S. Patents Ltd., London, for wet or dry grinding. At present arranged for dry grinding, complete with automatic feeding hoppers and stocking discharge filter. Arranged belt drive from fast and loose pulleys. Mounted on angle iron frame, 4 ft. 8 in. high by 2 ft. by 2 ft. Output dry grinding, ½ to 2 cwts. per hour.

Plauson Mill by Mather & Platt, type HK.214, steam jacketed, usual steam connections. Grinding chamber, 20 in. by 5 in., on cast-iron bed, belt-driven crown pulleys, 7½ in. by 5 in. face.

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CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone 3285 East.

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Also Stainless Steel Water-jacketed Pans with similar capacity, arranged for heating by water, oil, gas, electricity or steam.
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GRINDING of every description of chemical and other materials for the trade with improved mills.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams: "Hill-Jones, Bochurch, London." Telephone 3285 East.

LONDON FIRM offers complete service packing powders of all descriptions, also liquids and chemicals. Long runs only. Containers and packing cases for home and export, made on premises. Near to docks. Own rail sidings. Box No. 2331, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

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